Supplement to
MAESTRO for Windows 3
Software Manual
for
OCTÊTE PC
Integrated Alpha Spectroscopy System

Software Version 2.0x

Printed in U.S.A.

EG&G ORTEC Part No. 740140
Manual Revision A

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NOTE!

It is assumed throughout this manual that the reader is thoroughly familiar with Microsoft Windows® usage and terminology. If you are not fully acquainted with the Windows environment, including the use of the mouse, then...

> **it is strongly urged that you first read the Microsoft Windows software documentation to become familiar with some simple applications before proceeding!**

Microsoft Windows is intended to provide a "user-friendly" environment. Although the vocabulary and skills required may seem strange at first, they are absolutely essential to the efficient operation of MAESTRO for Windows 3.

NOTE: The convention used in this manual to represent actual keys pressed is to enclose the key label within angle brackets; for example, <F1>. For multiple keys, the key labels are joined by a + within the angle brackets; for example, <Alt+ 2>.

1. INTRODUCTION

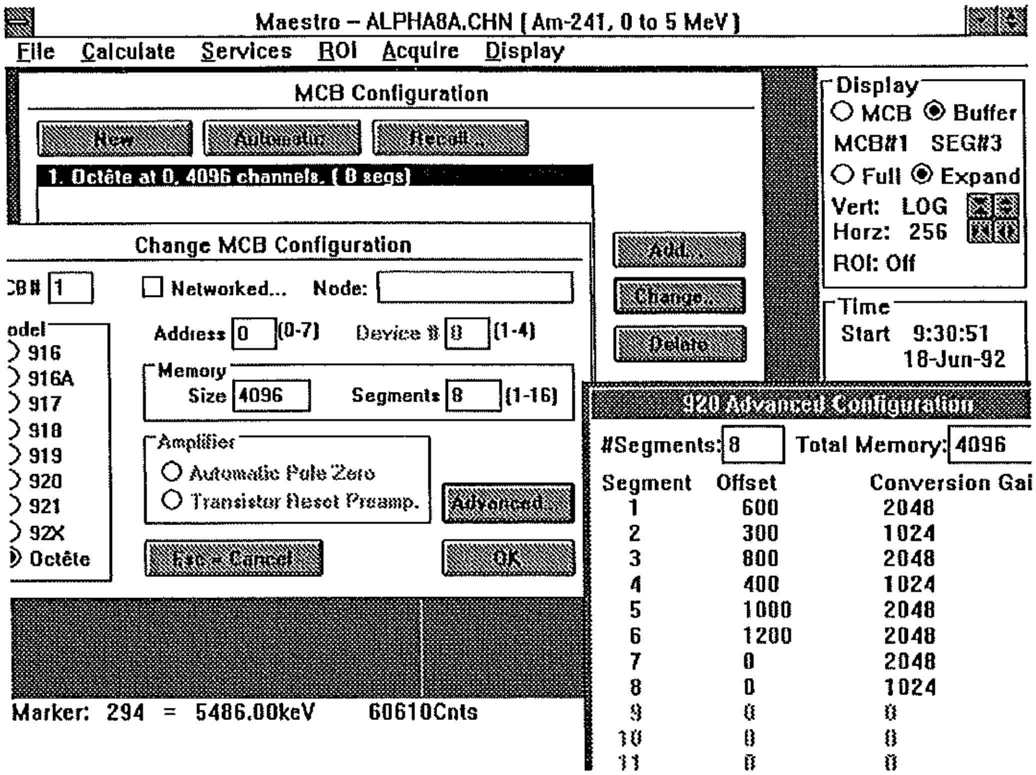
The OCTÊTE PC Alpha Spectrometer is an eight-chambered, alpha-particle counting station with integral analog electronics, detector bias supply, vacuum gauges, multichannel buffer (MCB), and computer interface. This MCB is a member of the family of MCBs developed by EG&G ORTEC to support varied nuclear counting needs. The OCTÊTE PC MCB, like all the other MCBs, is supported by the MAESTRO for Windows 3 MCA emulation software.

This manual describes the features of MAESTRO for Windows 3 that are unique for the OCTÊTE PC. These features will be described in the same form as the other features of MAESTRO are described in the manual supplied with MAESTRO for Windows 3. Please refer to that manual for general installation and operation of MAESTRO. These unique features are automatically enabled when an OCTÊTE PC is in the system.

2. MENU FUNCTIONS

2.1. Configuration

The OCTÊTE PC is configured using the configuration selection in the Services menu reached via the main menu bar, just as with all other MCBs. The automatic configuration is the easiest way to configure the system. The configuration dialog box is shown in Fig. 1. This is like the dialog box shown in the main manual except that the OCTÊTE PC is shown in the list of model numbers on the left side of the dialog. When the OCTÊTE PC is selected, the Advanced... button is active so that the 920 Advanced Configuration dialog box can be displayed. Because the 920 and the OCTÊTE PC share the same gain and offset logic, the dialog box is the same for both. The OCTÊTE PC can only have 8 inputs or


Maestro – ALPHA8A.CHN [Am-241, 0 to 5 MeV]
File Calculate Services ROI Acquire Display
MCB Configuration
New
Automatic
Recall...
Change MCB Configuration
Add...
Change...
Delete
Advanced...
Esc = Cancel
OK
920 Advanced Configuration

1. Octête at 0, 4096 channels. (8 segs)

:B# 1

☐ Networked... Node:

Address 0 (0-7) Device # 8 (1-4)

Memory
Size 4096 Segments 8 (1-16)

odel
○ 916
○ 916A
○ 917
○ 918
○ 919
○ 920
○ 921
○ 92X
● Octête

Amplifier
○ Automatic Pole Zero
○ Transistor Reset Preamp.

Marker: 294 = 5486.00keV 60610Cnts

Display
○ MCB ● Buffer
MCB#1 SEG#3
○ Full ● Expand
Vert: LOG
Horz: 256
ROI: Off

Time
Start 9:30:51
18-Jun-92

#Segments: 8 Total Memory: 4096

Segment	Offset	Conversion Gai
1	600	2048
2	300	1024
3	800	2048
4	400	1024
5	1000	2048
6	1200	2048
7	0	2048
8	0	1024
9	0	0
10	0	0
11	0	0

Fig. 1 Configuration Menus

segments. The detector inputs are referred to as "segments" here and on the spectrum display.

In the center of the configuration dialog box are input fields for "memory size" and "number of segments." For alpha-particle spectroscopy in the OCTÊTE PC, the memory size should be set to 4096 and the number of segments set to 8. This will give a segment size of 512 channels for each spectrum, which is appropriate. These selections must be done before the advanced menu is accessed.

The offset and conversion gain are used to control the starting energy and energy range of the spectrum collected. In many cases the low-energy portion of the spectrum contains no data of interest and may be discarded. The OCTÊTE PC uses digital offset in the MCB to accomplish this. The conversion gain is the number of channels corresponding to a full-scale input of 10 volts. In the OCTÊTE PC, the amplifier gain is set at the factory so that a 10 MeV alpha particle corresponds to a 10-volt output. All amplifier and MCB connections are internal to the system.

Table I shows the offset and gain settings, with the spectrum size set to 512 channels, for some commonly used spectrum energy ranges. The energy range can be the same for all inputs, different for all inputs, or any combination in between. Each input (segment) has its own energy calibration in the system. These are only examples; any other combination can be used.

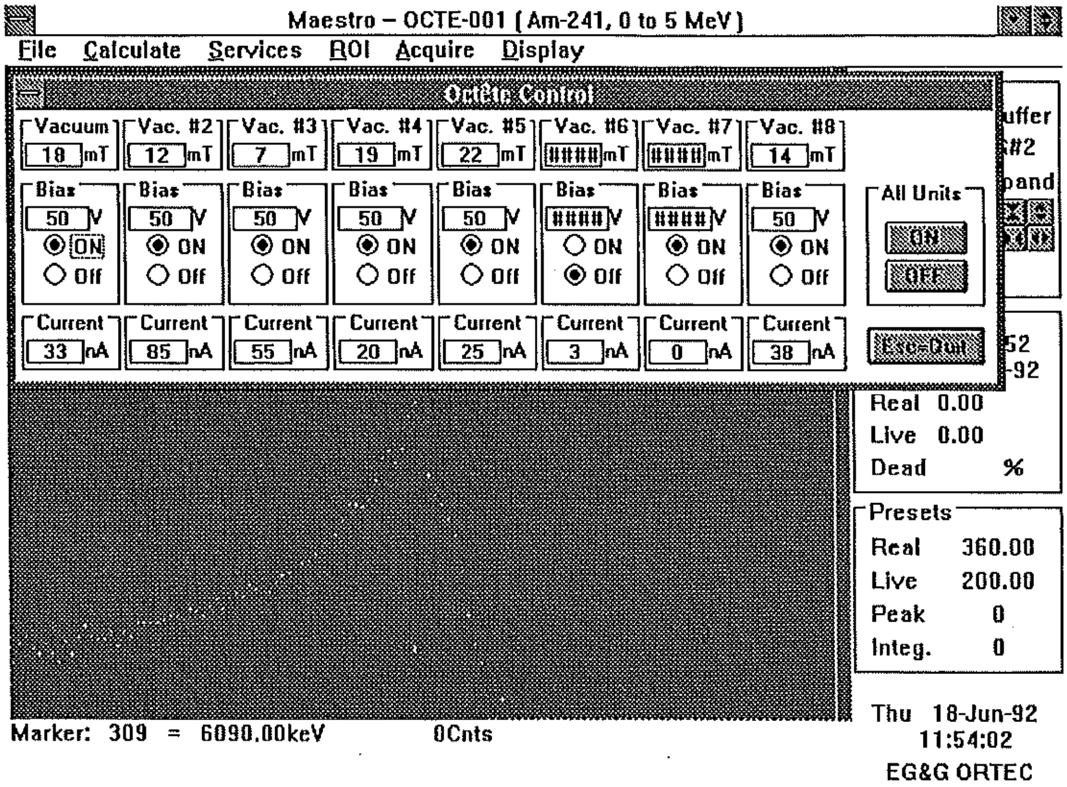
Starting Energy (MeV)	Ending Energy (MeV)	Offset	Conversion Gain
3.0	5.5	600	2048
3.0	8.0	300	1024
4.0	6.5	800	2048
4.0	9.0	400	1024
5.0	7.5	1000	2048
6.0	8.5	1200	2048

Spectrum size is 512 channels.

Table I Offset and Conversion Gain Settings

2.2. Vacuum and Bias

The chamber pressure and detector bias are measured and can be displayed in the OCTÊTE PC Control dialog box (Fig. 2) by MAESTRO. The dialog box is accessed from the Acquire menu, reached via the main menu bar using the OCTÊTE PC Control entry. The accelerator key is <F10>. If other MCB types are connected, the OCTÊTE PC Control entry is only available if the active MCB is the OCTÊTE PC. This same dialog box shows the detector bias and leakage current. The detector bias can be turned on and off now, one detector at a time, or all at once.



Vacuum	Vac. #2	Vac. #3	Vac. #4	Vac. #5	Vac. #6	Vac. #7	Vac. #8
18 mT	12 mT	7 mT	19 mT	22 mT	#### mT	#### mT	14 mT
Bias 50 V	Bias 50 V	Bias 50 V	Bias 50 V	Bias 50 V	Bias #### V	Bias #### V	Bias 50 V
● ON ○ Off	● ON ○ Off	● ON ○ Off	● ON ○ Off	● ON ○ Off	○ ON ● Off	● ON ○ Off	● ON ○ Off
Current 33 nA	Current 85 nA	Current 55 nA	Current 20 nA	Current 25 nA	Current 3 nA	Current 0 nA	Current 38 nA

Real 0.00
Live 0.00
Dead %

Presets
Real 360.00
Live 200.00
Peak 0
Integ. 0

Marker: 309 = 6090.00keV 0Cnts

Thu 18-Jun-92
11:54:02
EG&G ORTEC

Fig. 2 Vacuum and Bias Display and Control

2.2.1. Vacuum

The pressure in each chamber is displayed in milliTorr. If the pressure is above the range of the vacuum gauge (about 1000 mT), then the pressure is displayed as #### (see Vac. #6 in Fig. 2).

If the Vacuum/Bias Interlock (on the rear panel of the OCTÊTE PC) is engaged, then the bias will show #### (see Vac. #7 in Fig. 2) when the vacuum is above the cutoff pressure setting. The cutoff pressure can be set to either 100 mT or 500 mT (see the hardware manual for factory setting and how to change it).

The vacuum is controlled by the valve on the front of the unit. The computer continuously monitors the vacuum whenever the dialog box is shown.

2.2.2. Detector Bias

The bias for all detectors can be turned on and off by the "All Units" On/Off buttons (Fig. 2), which will turn bias on (or off) for all the detectors at one time. The On/Off radio buttons for each input can be used to turn that particular detector's bias on and off.

The bias can be disabled by the vacuum/bias interlock (switch on rear panel). If the bias is set "ON," the ON radio button has a black center even if the bias has been shut off by the interlock. In this condition, bias will be automatically re-applied when the vacuum improves sufficiently or the interlock switch is set to OFF. If the bias is in the OFF state, the OFF radio button has the black center. If the bias is disabled or turned off, the voltage value is displayed as ####.

When the bias is on, the detector leakage current is shown in the "Current" box for each detector. The leakage current is detector dependent and will be near 0 when the bias is turned off.

When displayed, the OCTÊTE PC Control dialog box is continuously updated with inputs from the OCTÊTE PC. To exit from this dialog, press <ESC> or use the dialog box main menu (upper left corner) to "Close" it. Other functions of MAESTRO are not available when this box is displayed.

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A65-BI

MAESTRO™ for Windows 3

MCA Emulator for Microsoft Windows 3.x
Software User's Manual

EG&G ORTEC

ADDENDUM

Network Support

MAESTRO™ for Windows 3

Printed in U.S.A.

ORTEC Part No. 751400
Rev. A

4017 0691

REFER TO: 1.1. MCA Emulation

Version 2.0 of MAESTRO for Windows 3 offers the user a number of enhancements over version 1.0, and these are explained in this document. This information augments the more complete discussion presented in the Software User's Manual (part no. 762850), and gives more details on those areas not covered in that Manual.

REFER TO: 1.2. Hardware

In addition to the hardware recommended in the User's Manual, network hardware is supported by version 2.0. Underlying support must include NetBIOS. Consult the factory for a list of acceptable network interface cards. Both remote MCBs (using A14-BI) and network printers and disk drives are supported. The hardware required at the remote MCB Gateway to complete the configuration is discussed in the A14-BI manual.

REFER TO: 1.3. MCBs, Devices, and Segments

MAESTRO for Windows 3 will now control up to 20 MCB Devices, in any combination of local and networked. The first 12 can be switched using the keyboard Ctrl-F*n* as before, and the remaining by using the "Select MCB" dialog (under DISPLAY menu).

REFER TO: 1.4. MAESTRO for Windows 3 vs MAESTRO II

In addition to the differences listed in the Manual, the differences specific to version 2.0 include support for the network, and a few minor enhancements such as the increase in the total number of MCBs supported from 8 (or 12 for version 1.0) to 20.

REFER TO: 2.3. Installation Procedure

Be sure to consult the READ.ME file included on the distribution diskette(s) for up-to-date information.

Fine-tuning tips to optimize operation of MAESTRO for Windows 3 in a networked environment:

> VERY IMPORTANT: Make sure that the "FILES=30" and "BUFFERS=25" (or larger) are set in CONFIG.SYS.
>
> The "NetHeapSize" setting in WIN.INI should be defaulted or set to no less than 8K.

REFER TO: 3.2. Initial Configuration

More than one copy of MAESTRO can be running on a single workstation at one time. The MCB configuration is shared among all copies running on any given workstation. The first copy of MAESTRO that accesses MCBs (via MCB.DLL) loads the configuration. Then, all subsequent copies share this same configuration. Furthermore, the first copy cannot be closed until all other copies are closed first. The configuration can only be modified (via the Configuration dialog under the SERVICES menu) by the first copy, while no other copies are running on this workstation.

REFER TO: 6.1. Acquire

6.1.10. 92X Control...

The 92X **Control...** dialog has been modified slightly, in that the "2uSec." and "6uSec." Shaping Time selections have been changed to "SHORT" and "LONG", to accomodate custom shaping times that differ from the usual factory settings.

REFER TO: **6.5. File**

6.5.3. Using File Dialogs

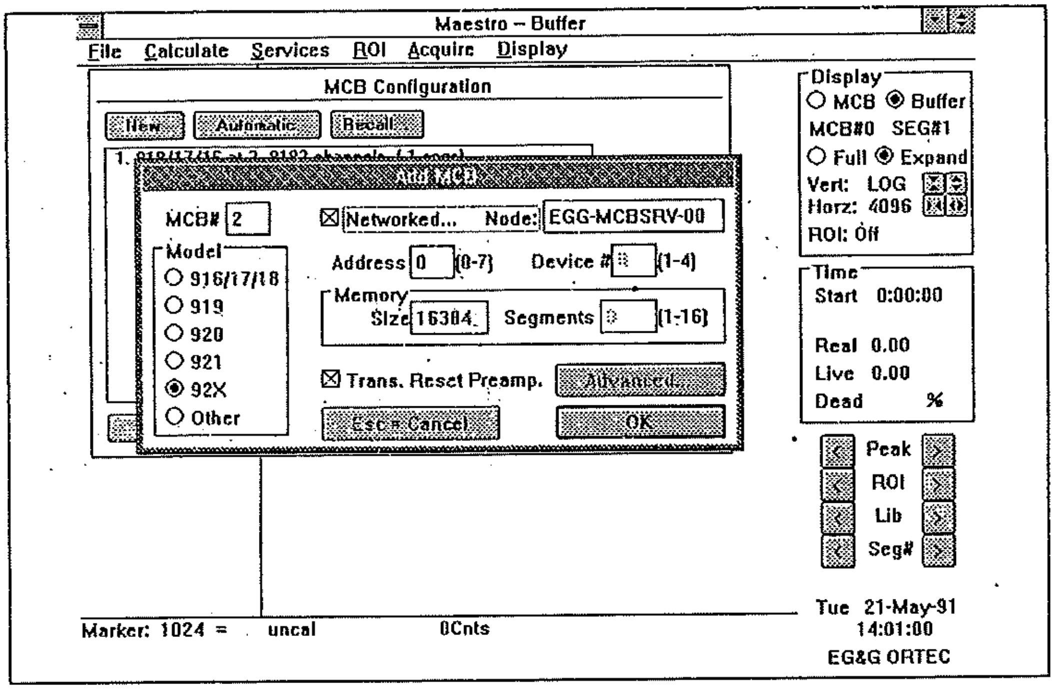
Various File Dialogs have been modified slightly to show more files in the list box. Also, the list box shows multiple columns and is scrolled from left-to-right rather than vertically as shown in the Manual.

Many networks provide remote file servers. If installed, these are listed in the File Dialogs as drives such as "F:" (depending on the connections established with network utilities). These "network drives" are treated by MAESTRO just like normal hard disks, and may be used for storage and retrieval of Spectral Data, ROIs, Reports, etc.

REFER TO: **6.6. Services**

6.6.1. Configuration...

Note that this dialog is unavailable when more than one instance of the application is running. (The menu entry will be "grayed".) Also, the Add... and Change... buttons bring up a slightly different dialog box in version 2.0. This is shown in the revised Fig. 42 below.



MCB# 2

☒ Networked... Node: EGG-MCBSRV-00

Model
○ 916/17/18
○ 919
○ 920
○ 921
● 92X
○ Other

Address 0 (0-7) Device # (1-4)

Memory
Size 16384 Segments (1-16)

☒ Trans. Reset Preamp.

Display
○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 4096
ROI: Off

Time
Start 0:00:00
Real 0.00
Live 0.00
Dead %

Marker: 1024 = uncal 0Cnts

Tue 21-May-91
14:01:00

Fig. 42. Adding (or Changing) an MCB to Configuration.

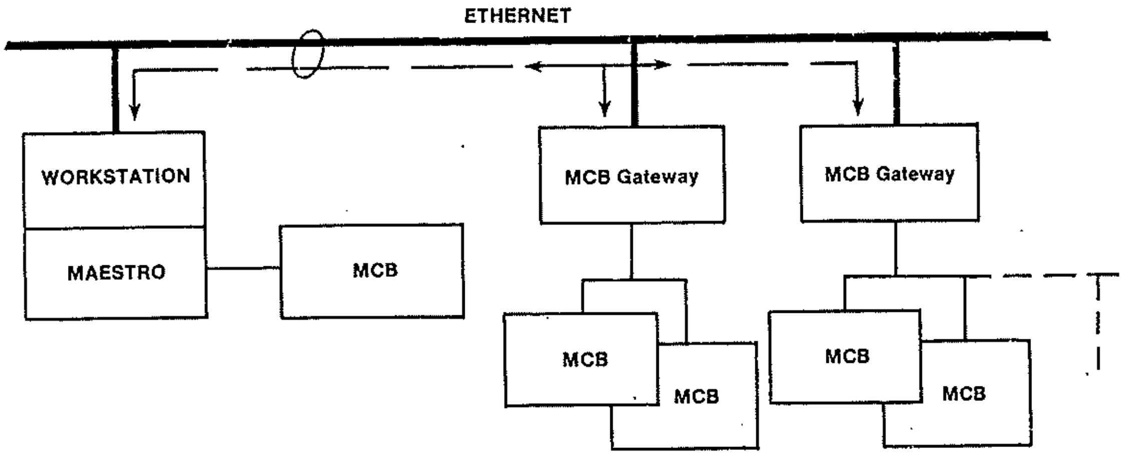
The new fields are the "Networked" check box and the "Node" entry. All other fields in this dialog perform as documented in the original Manual. Local MCBs are configured as before, with the Networked field unchecked.

Remote MCBs to be accessed via the network are configured with the Networked box checked (on). A network node "nickname" of up to 15 characters must be supplied in the Node field (exactly the same name, including upper and lower case, that the remote MCB Gateway program is using). Each node must have a unique name. The Address field is the MCB hardware address in the remote configuration (the remote MCB number from 1 to 8, decremented by 1 to a value between 0 and 7).

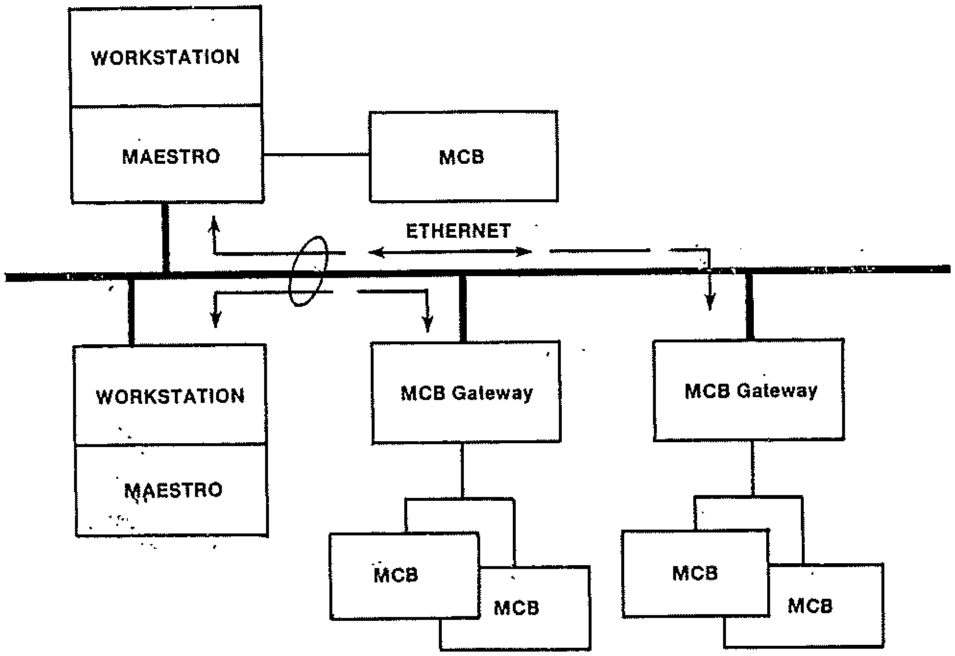
When the configuration is applied with a networked MCB involved, several seconds are usually required while a session with the remote MCB is established (even if there are only two devices on the network; this timing is established by parameters of the network software to accommodate the speed of the network hardware). After the session has been successfully established, the networked MCB is handled just like local MCBs for selection, display, acquisition, etc., using the same controls as documented in the Manual. However, some network installations may not be as fast for spectral data display update while the networked MCB is selected; i.e., the performance may be limited by the bandwidth of the network and/or the speed of the remote MCB Gateway.

It is possible to establish connections with more that one remote MCB on the network simultaneously. These can be MCBs on one or more remote MCB Gateways. However, it is NOT possible for more than one workstation running MAESTRO to establish connections with the same MCB Gateway on the network, even if only one is actively displaying the data. This is because MAESTRO establishes a session with the remote MCB Gateway during initialization, and leaves this session open until the application is closed (regardless of whether it is actively displaying data from the MCB Gateway), in order to minimize the time required to switch among MCBs. (Establishing a network session is very time-consuming, as mentioned earlier.) Of course, it is possible for two different workstations running MAESTRO to simultaneously access two different MCB Gateways on the same network without interference.

The following figures show two typical situations:



One Workstation and Two MCB Gateways.



Two Workstations, Each with a Single MCB Gateway.

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Note to users of OCTÊTE PC:

OCTÊTE PC, a computer-controlled alpha spectroscopy workstation, has recently been added to the ORTEC product line of spectroscopy systems.

In case you have an OCTÊTE PC, details of the additional functionality are included as a supplement with this manual.

For A64-BI, MAESTRO II (for DOS), there are additional programs to be installed. These should be installed AFTER the A64-BI product itself has been installed.

For A65-BI, MAESTRO for Windows 3, there are no additional programs.

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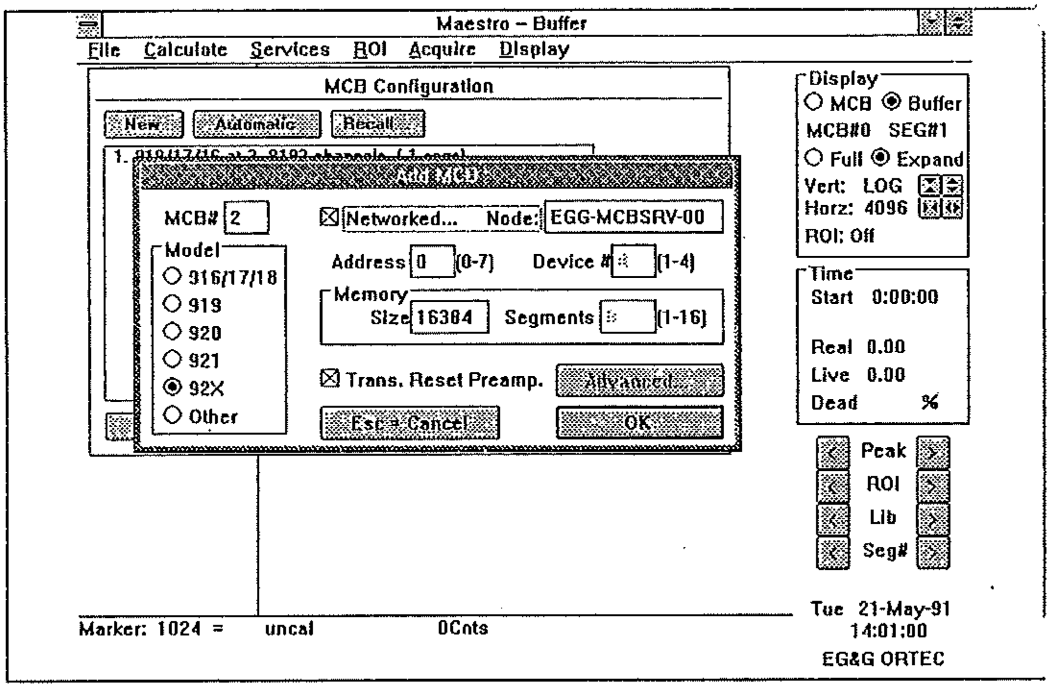

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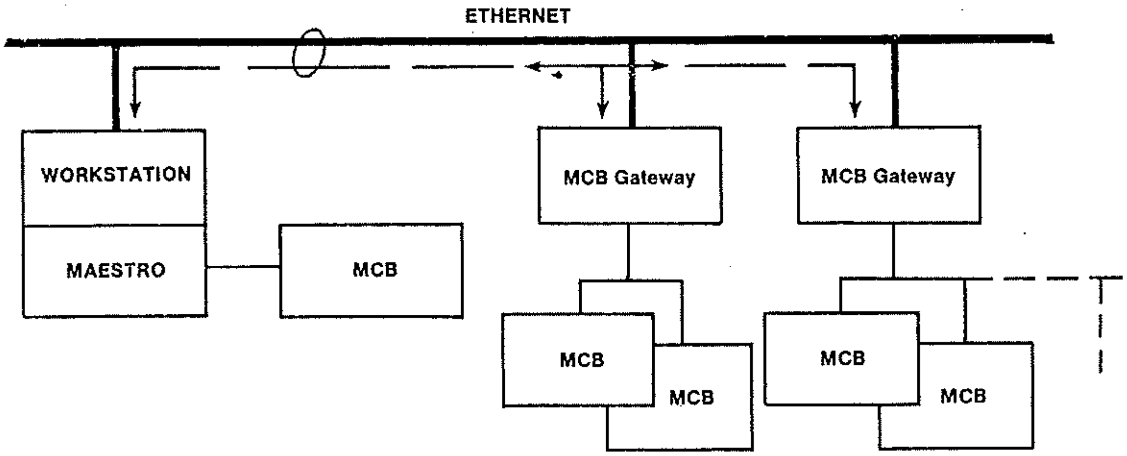

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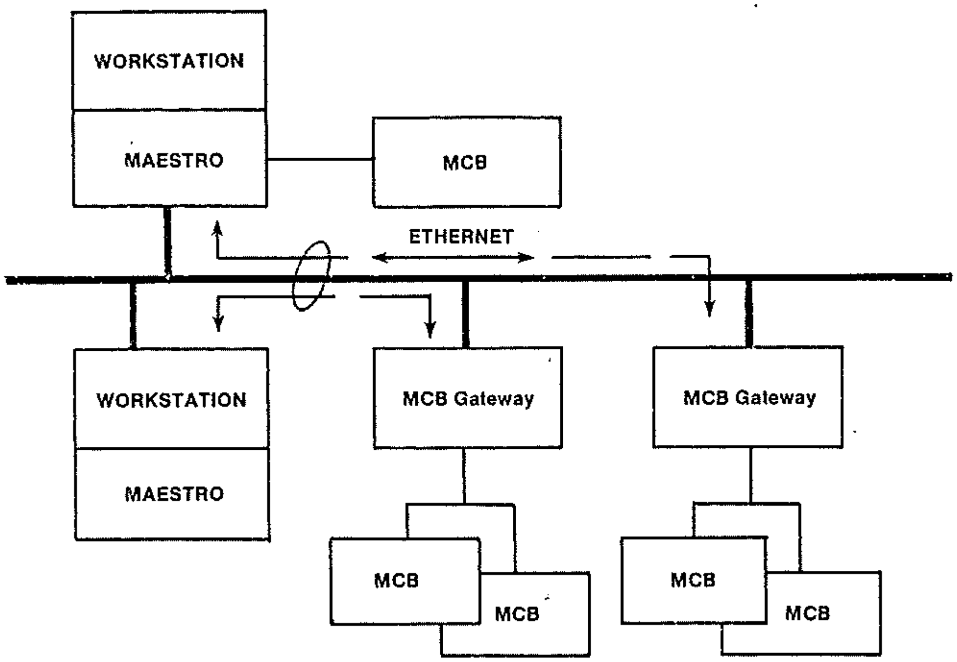

Two Workstations, Each with a Single MCB Gateway.

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NOTE!

It is assumed throughout this manual that the reader is thoroughly familiar with Microsoft Windows usage and terminology. If you are not fully acquainted with the Windows environment, including the use of the mouse, then...

> it is strongly urged that you first read the Microsoft documentation supplied with your Windows software and familiarize yourself with a few simple applications before proceeding!

Microsoft Windows is intended to provide a very "user-friendly" environment, although the vocabulary and skills required may seem strange at first; but these are absolutely essential to the efficient operation of MAESTRO.

NOTE: The convention used in this manual to represent actual keys pressed is to enclose the key label within angle brackets; for example, <F1>. For multiple keys, the key labels are joined by a + within the angle brackets; for example, <Alt+ 2>.

1. INTRODUCTION

1.1. MCA Emulation

A *MultiChannel Analyzer* (MCA), in its most basic form, is an instrument that sorts and counts events in real time. This sorting is based on some characteristic of these events, and the events are grouped together into bins for counting purposes called *channels.* The most common type of multichannel analysis, and the one which is of greatest interest to nuclear spectroscopists, is *Pulse-Height Analysis* (PHA). PHA events are signal pulses originating from a detector, and the characteristic of interest is the pulse height or voltage, which is proportional to the particle or photon energy. An *Analog-to-Digital Converter* (ADC) is used to convert each pulse into a channel number, so that each channel corresponds to a narrow range of pulse heights or voltages. As pulses arrive over time, the MCA will collect in memory a distribution of the count of pulses with respect to pulse height (a series of memory locations, corresponding to ADC channels, will contain the count of pulses of similar, although not necessarily identical, height). This distribution, arranged in order of ascending energies, is commonly referred to as a *spectrum.* To be useful, the acquired spectrum must be available for storage and/or analysis, and is displayed on a graph whose horizontal axis represents the height of the pulse and whose vertical axis represents the number of pulses at that height, also referred to as a *histogram.*

MAESTRO, combined with *multichannel buffer* (MCB) hardware and a personal computer, emulates an MCA with remarkable power and flexibility. The MCB performs the actual pulse-height analysis, while the computer and operating system makes available the display facility and data-archiving hardware and drivers. The MAESTRO software is the vital link that marries these components to provide meaningful access to the MCB via the user interface provided by the computer hardware.

The MAESTRO for Windows 3 MCA emulation continuously shows the currently acquiring spectrum, the current operating conditions, and the available menus. All important operations that need to be performed on the spectrum, such as peak location, ROI insertion, display scaling, and sizing are implemented with both the keyboard (accelerators) and controls accessible with a mouse. Spectrum peak searching, report generation, printing, archiving, calibration, and other analysis tools are available from pull-down menus. Some menu functions have more than one accelerator so that both new and experienced users will find the system easy to use. A so-called *Buffer* is maintained in the computer memory to which one spectrum can be moved for display and analysis, either from the MCB memory or from disk, while another spectrum is collected in the MCB.

1.2. Hardware

MAESTRO for Windows 3 will run on any IBM AT, PS/2 or compatible computer that supports Microsoft Windows (version 3.0 or later) in Standard 286 or Enhanced 386 mode. A minimum of 1MB of memory is required; 2MB or more is recommended. A VGA display and a fixed disk of at least 10MB capacity are also recommended. Data can be saved or retrieved from any number of floppy or fixed disk drives. A floating-point coprocessor is not required, but will noticeably accelerate some calculations if installed. Front-end acquisition hardware supported includes EG&G ORTEC's ADCAM® or *Spectrum Master*™ Multichannel Buffers (MCBs) interfaced to the computer with an appropriate adapter card and cable.

1.3. MCBs, Devices, and Segments

MAESTRO for Windows 3 will control up to 12 MCBs. These can be any properly installed (and hardware configured) mixture of the following types of units: 916A, 917, 918A, 919, 920, 921, and 92X. MAESTRO will correctly display and store a mixture of different sizes of spectra. The MCBs in any given system are assigned unique identification numbers between 1 and 12. Only one MCB is selected for display at a given time; its number is shown on the upper right of the status window of the display. Note that the 919-type unit actually consists of more than one *device* that act as independent MCBs. Thus, one physical 919 unit can be up to four numbered MCBs.

More than one MCB can be added to a system (or more than one device on a 919 can be enabled) to expand the system for more detectors. When the system incorporates a 916/17/18 type MCB, the system can also be expanded by attaching a Mixer/Router module (such as the 476). In the 916/17/18 so equipped, the MCB memory is divided into *Segments* so that each input has an equal share of the MCB memory, the size of which matches the conversion gain or maximum channel number of the ADC. A similar segmentation scheme holds true for the 920 MCBs as well, since the 920 units employ integral 8 or 16 input multiplexers, although the conversion gain for any given input can be different than the size of its corresponding segment in this case.

Throughout this manual reference is made to *MCB/Segment.* This means that the operation being discussed will use or affect only the selected Segment of the selected MCB. The working MCB number and Segment number are displayed at all times by MAESTRO. The MCB is selected with the DISPLAY...SELECT MCB dialog (or with the <Ctrl+ Fi> accelerators for i = 1 through 12), and the segment is selected by moving the marker into the memory section desired.

1.4. MAESTRO for Windows 3 vs MAESTRO II

Previous users of the MAESTRO II program for the MSDOS/PCDOS environment should have little difficulty learning and using MAESTRO for Windows 3, especially if they first take the time to become familiar with typical Windows applications. The many similarities between the two applications are intentional. But there are some differences, aside from the obvious differences arising from the fact that the environments they are hosted in are entirely distinct. MAESTRO for Windows 3 provides several other features that distinguish it from MAESTRO II, as follows:

MAESTRO for Windows 3 has more display formats in addition to the point (dots) display; namely, the ability to fill in the Regions Of Interest (ROIs) or all spectrum areas. Furthermore, the colors of the various display areas can be changed easily from a preferences dialog, rather than leaving the program and running a separate program as was true for MAESTRO II.

MAESTRO for Windows 3 has a built-in *configuration* dialog instead of an external program (MAESTRO II required M2SETUP). Configuration may be altered while the program is running. It also allows automatic configuration, saving and loading files, etc. Also, advanced configuration features such as individual segment programming of conversion gain and offset for 920-type MCBs has been added.

The MCB numbering is more flexible — MCB numbers are not limited to the physical address as in MAESTRO II (although they *can* be numbered that way); the only restriction is that each MCB address (and device) have a unique MCB number.

JOB instead of CMD files, with a superset of commands.

MAESTRO for Windows 3 has no "RUN PROGRAM" nor "EXIT TO DOS" since it is so easy to run and switch among other applications in Windows. (There is, however, a RUN command in the JOBs which allows execution of .EXE programs.)

MAESTRO for Windows 3 has a few more key functions — keypad</> for toggling LOG/LINEAR; keypad<5> for centering cursor. Note also that the keypad functions do not disable COMPARE, while the corresponding F-keys do; therefore, use keypad <+>/<-> instead of <F7>/<F8>, etc., while in COMPARE mode.

ROI Begin/End can be accomplished by the right mouse button.

MAESTRO for Windows 3 has a special "Indexing Buttons" overlay while the Buffer is displayed, providing mouse-accessible functions for peak searching, ROI searching, library indexing, and segment changes.

MAESTRO for Windows 3 has mouse-accessible "Scaling Buttons" which duplicate keyboard functions for vertical and horizontal scale changes.

The COMPARE mode has been enhanced, allowing many more functions and display manipulations while two spectra are being compared.

DETECTOR and SAMPLE descriptions are more accessible in MAESTRO for Windows 3 (from the SERVICES menu).

MAESTRO for Windows 3 has the ability to load other libraries besides the LIB.MCB file loaded when the application is started, or while it is running.

MAESTRO for Windows 3 relies upon the 919/920/921/92X's ability to store start date/time in battery backed-up RAM, instead of using .STR start files. (However, .STR start files are created as before for 916/17/18-type MCBs.) Further, the date/time is obtained from the DOS clock and used to program the MCB time-of-day clock whenever the presets are changed.

MAESTRO for Windows 3 also stores .STR start records for 916/17/18-type MCBs when the RESTORE function is executed, in addition to ACQUIRE.

More than one REPORT format is provided; the columnar format is new to MAESTRO for Windows 3, and should make the data more accessible to other applications such as spreadsheets.

Note also that most of the file formats have been retained from MAESTRO II. Thus, spectral data (.CHN files) can be exchanged between the two applications. Also, the start records (.STR files) and nuclide library files (e.g., LIB.MCB) are identical. Unlike MAESTRO II, however, MAESTRO for Windows 3 has the capability of Recall from .SPC spectral file format; in this case, the full quadratic calibration is utilized as well.

2. INSTALLATION

2.1. For Those Who Can't Wait...

Make a directory C:\MCA and copy all the files there. Then add the following line to CONFIG.SYS:

```
DEVICE=C:\MCA\MCBSHARE.SYS
```

Also, copy the file MCB.DLL to the place where windows expects its dynamic link libraries to be located (usually C:\WINDOWS.)

That's all there is to it! Reboot the system, and run WINMCA.EXE from the file manager or the RUN... function (under the FILE menu on the main window).

Most of the system should be fairly self-explanatory for users already familiar with the Windows user interface. Please note that the mouse (with left button depressed) can be used to "drag" the marker to any point in the spectrum, as well as to point and shoot at the MCB/BUFFER and FULL/EXPAND radio buttons and Vertical or Horizontal scaling buttons in the status area, besides its normal functions in accessing menus, etc.

2.2. Programs

WINMCA.EXE is the main program for the MAESTRO application.

MCBSHARE.SYS is the DOS device driver used for access to the MCB hardware by MAESTRO, and to ensure cooperation among applications requiring access to the MCB hardware. It is required for operation of MAESTRO and must be installed prior to booting DOS and running the application.

MCB.DLL is the Windows Dynamic Link Library used for access to the MCB hardware by MAESTRO. It is required for operation of MAESTRO and must be installed prior to running WINMCA.EXE.

MAKELIB.EXE, PLOTS.EXE, etc. are utility programs for support only and are not required for routine operation of MAESTRO. MAKELIB converts a library text file into the format used by the MCA and needs to be installed only if new or additional library files are to be created. A general-purpose nuclide library file LIB.MCB is supplied with the application. PLOTS.EXE operates in the DOS Box to plot spectral data on a HP7470A plotter.

2.3. Installation Procedure

The Microsoft Windows (V3) manual describes the general procedure for adding programs to the desktop. This most convenient way to add programs to the system is described below. Other ways to run the program are described in the Microsoft Windows manual. It is also important to review the Windows documentation to optimize the operation of Windows (and Windows applications) for the hardware in the system (e.g., see HIMEM.SYS).

(1) Create a subdirectory (such as d:\MAESTRO).

(2) Copy all of the files from the distribution diskette(s) to this subdirectory. In addition to the program files listed above, some data files such as LIB.MCB are included and should be copied. MCBSHARE.SYS may be moved to another directory such as the root directory.

(3) Add the following line to the CONFIG.SYS file:

```
DEVICE=[d:\..path..\]MCBSHARE.SYS
```

where [d:\..path..\] is the path where MCBSHARE.SYS is located.

(4) The MCB.DLL file may be moved to another directory that is searched by Windows for its Dynamic Link Libraries (typically, \WINDOWS, \WINDOWS\SYSTEM, or some other directory in the PATH where other .DLL programs are located.) MCB.DLL may be left in the same directory with WINMCA.EXE, however.

(5) It is recommended that some files (notably, the configuration MCB.CFG, any .STR start records, and the LIB.MCB library file) be kept in a separate subdirectory. In this case, an environment string

will have to be added using the SET command (usually included in AUTOEXEC.BAT) as follows:

```
SET MCBPATH=[d:\][..\<path>\..]
```

Otherwise, MCB.CFG, LIB.MCB and .STR files are expected to be located in the directory from which the WINMCA.EXE program was initially started.

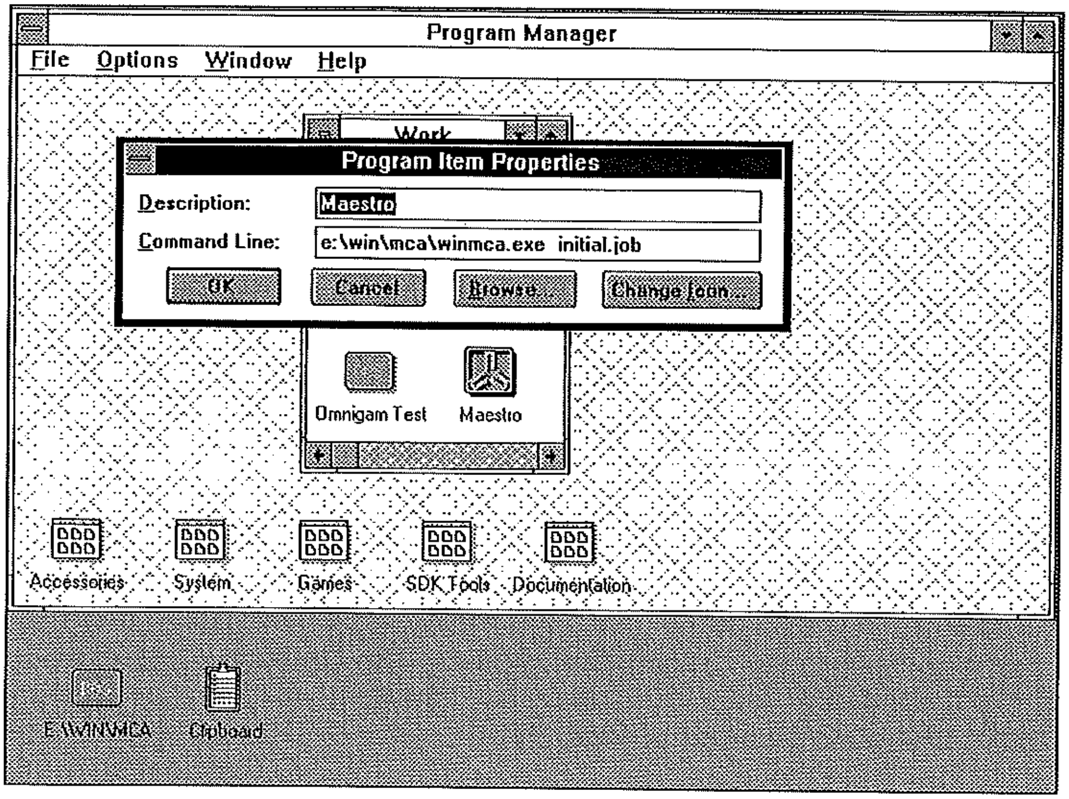
(6) To prevent memory management problems on 386 machines, in the 386 enhanced mode it is strongly recommended that NOTEPAD be used to add the following line into the [386Enh] section of SYSTEM.INI:

```
EMMExclude=D000-DFFF
```

(7) Reboot the system, thus putting the changes to the CONFIG.SYS file into effect.

(8) At the Windows desktop, install WINMCA.EXE into some program group, so that the EG&G icon appears. The command line options are described later, but may be omitted. A typical desktop installation is pictured in Figure 1.

This completes the required installation of MAESTRO. The application may now be executed by double-clicking on its icon.



Description: Maestro

Command Line: e:\win\mca\winmca.exe initial.job

Fig. 1. Example Windows Desktop Installation of MAESTRO.

3. STARTUP AND CONFIGURATION

The MAESTRO MCA emulation software is a Windows application, meaning that it must be run in the Windows environment and will not run from the DOS command line. It is started after installing it as an icon into a Windows desktop program group (as described earlier, and with or without arguments as described below) and then by double-clicking on the icon. The application comes up maximized to full-screen (and, of course, can be reduced to an overlapping window or minimized.)

3.1. Command Line Options

The form of the command line for invoking MAESTRO is:

```
WinMca.exe  -C file.cfg  -L file.mcb  file.job
```

All of the arguments are optional; one or more can be omitted. Thus, at a minimum, MAESTRO can be executed without any arguments at all, in which case certain defaults apply for the initial configuration and nuclide library, as described below. As shown, there are three possible command line arguments:

`-C file.cfg`	uses "file.cfg" for the initial configuration instead of the default "MCB.CFG" described below. This can include a path specification, and the MCBPATH environment variable is ignored.
`-L file.mcb`	pre-loads the nuclide library "file.mcb" instead of the default library LIB.MCB. This can include a path specification, and the MCBPATH environment variable is ignored.
`file.job`	begins execution of the job "file.job" immediately.

Certain defaults apply if any one or more of these arguments is omitted. The initial configuration is obtained by default from "MCB.CFG" on the default path specified by the environment variable MCBPATH, as described below. The nuclide library is assumed to be "LIB.MCB" by default on MCBPATH. And no job is automatically executed unless the "file.job" argument is included.

3.2. Initial Configuration

In routine usage, the user need not be concerned with the existence of the required **MCB.CFG** file discussed here, since if this file doesn't exist, it will be created automatically by MAESTRO, as described below.

Unless the `-c file.cfg` command line option is included (as described above), the disk file MCB.CFG is automatically read when the program is started, to define the hardware configuration. MCB.CFG is located in a path defined by the MCBPATH environment string, or (if the MCBPATH variable is undefined or the file is not present there) in the directory from which the application is initially started. If MCB.CFG cannot be located, the program performs an automatic configuration to determine the presence of any MCB hardware. While all of this is going on, the window is empty except for a line of text which reads something like:

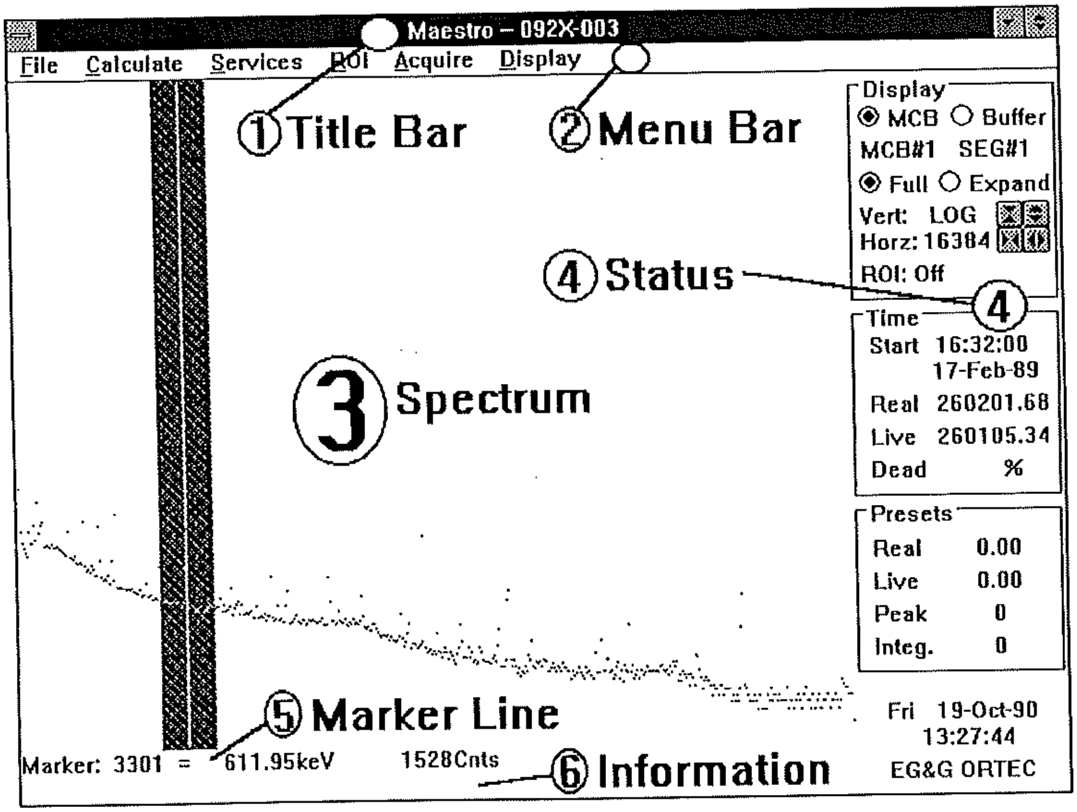
```
Please wait while configuration is obtained...
```

By *configuration* we refer to the collection of information which identifies all valid MCBs in the system, specifying the number, type, and physical address of the MCBs, the memory size and conversion gain of each, and the most recent calibration data for each MCB. This configuration can be modified while the application is running by using the SERVICES...CONFIGURATION dialog. When MAESTRO is exited, all this data is automatically saved in the MCB.CFG file so that when MAESTRO is restarted, it recognizes the previously established configuration and restores any previous calibration(s). Certain items are expressly NOT stored in the configuration, namely the presets and start date/times. These items are stored elsewhere (see sections describing Presets and/or Acquisition Start records.)

If no MCB hardware can be identified (either from entries in MCB.CFG or through automatic configuration), or if they do not respond normally, a warning message box appears. In this case, the Buffer is displayed, and the "ACQUIRE" function on the menu bar is grayed (disabled). If at least one MCB is identified, then the display for the first identified MCB appears.

4. DISPLAY FEATURES

After the program is started and configuration is complete, the screen should look generally similar to Fig. 2. (Although the figures are in black and white, the actual screen will be in color or shades of gray, depending on the system display.)



Display
● MCB ○ Buffer
MCB#1 SEG#1
● Full ○ Expand
Vert: LOG
Horz: 16384
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Fri 19-Oct-90
13:27:44
EG&G ORTEC

Marker: 3301 = 611.95keV 1528Cnts

Fig. 2. Display Features.

The display contains the following features:

(1) Title bar, showing the source of the currently displayed spectrum. This is either the MCB version identification string obtained directly from the MCB, or the word "Buffer" if the Buffer is selected, or the name of the file if a file has been recalled and not yet modified, and accompanied by the sample description if that has been entered.

(2) **Top-level Menu bar**, showing the menu functions selectable using the keyboard and/or mouse as for any Windows application. The menu functions themselves are discussed in further detail in a subsequent chapter.

(3) **Spectrum Window**, showing a graphical data histogram and a vertical line to indicate marker position; distinct colors delineate the expand portion. Note that when the mouse pointer is passed into this area, its appearance changes to that of the EG&G icon.

(4) **Status Window**, to the right of the spectrum, providing information on MCB vs Buffer, FULL vs EXPAND, vertical and horizontal scale, the current presets, the counting times, and the current time and date. The radio buttons here not only show the status, but can also be used in conjunction with the mouse pointer to change the status. The four small buttons next the vertical and horizontal scale readings are used to adjust the scaling. (Also, while in the Buffer mode, a set of buttons is overlaid onto the lower portion of this window to provide for easy movement to peaks, ROIs, library entries, or segments.)

(5) **Marker Information Line**, showing Marker channel, calibration and contents, shown beneath the spectrum.

(6) **Supplementary Information Line**, beneath the marker line, used to show results of some calculations, some simple warning messages, or to give simple instructions to the user in certain procedures.

4.1. Spectrum Display

As mentioned above, the Spectrum window shows a histogram of the currently selected spectrum, whether an MCB or the Buffer. This is the central feature of the MAESTRO display. All other windows and most functions relate to this Spectrum. When the mouse pointer is passed into this window, it changes in appearance to the "three-cornered" EG&G trademark (see Fig. 3). The marker is represented in this window as a reversed-color line stretching from top to bottom in the window at the horizontal position of the pixel representing the marker channel. The marker can be moved with the mouse pointer, as described in the following section.

Note that the actual spectrum is scaled to fit in the window as it appears on the display. Also, since the window itself can be arbitrarily resized (a feature of Windows), it follows that the scaling is not always by powers of two, nor even integral multiples. Algorithms are used by MAESTRO; however, to scale the window properly and maintain the correct peak shapes regardless of the actual size of the window. The vertical displacements are simply scaled down by the ratio of the vertical counts full-scale value divided by the vertical size in pixels of the Spectrum window. The horizontal scaling is a little more complex, and is accomplished by "bunching" channels together for display purposes when necessary.

Depending on the expansion, segmentation and/or overall size of the spectrum, all or part of the selected spectrum is shown, and the number of channels may be larger than the horizontal size of the window (as measured in pixels). In this case, where the number of channels shown exceeds the window size, all of the channels cannot be represented by exactly one pixel dot. Rather, the channels are grouped together, and the vertical displacement corresponding to the maximum channel in each group is displayed, thus maintaining a meaningful representation of the relative peak heights in the spectrum. For more precise representations of peak shapes involving all available data (i.e., where each pixel corresponds to exactly one channel), the EXPAND display should be used and the scale should be expanded until the number of channels is less than or equal to the size of the window.

Note that the marker can be moved by no less than one pixel or one channel (whichever is greater) at a time. In the scenario described above, where there are many more memory channels being represented on the display than there are pixels horizontally in the window, then the marker will move by more than one memory channel at a time, even with the smallest possible change as performed by the right <→> and left <←> arrow keys. If true single-channel motions are required, then the display should be expanded, as described above.

The spectrum display can be manipulated using the DISPLAY menu and/or the keys as shown in Table 1 and Fig. 8, and discussed in further detail in the next section. Also, the mouse can be used to perform most of these functions very efficiently, as discussed below.

4.2. Using the Mouse

The mouse can be used to perform every function in MAESTRO (aside from entering labels), and usually more efficiently than with the keyboard. Note that the appearance of the mouse pointer changes when it is passed into the Spectrum window, where it appears as the EG&G, Inc. trademark icon, shown below.

Fig. 3. EG&G Icon.

Depressing the left mouse button (Fig. 4) while the pointer is in the Spectrum window causes the marker to be "dragged" with the mouse (i.e., as long as the button is held down, the marker will try to stay at the horizontal position of the mouse pointer). This is generally a much easier way to roam the marker around in the spectrum than the keyboard (arrow keys, etc.), although some keyboard functions may still be preferred for specific motions.

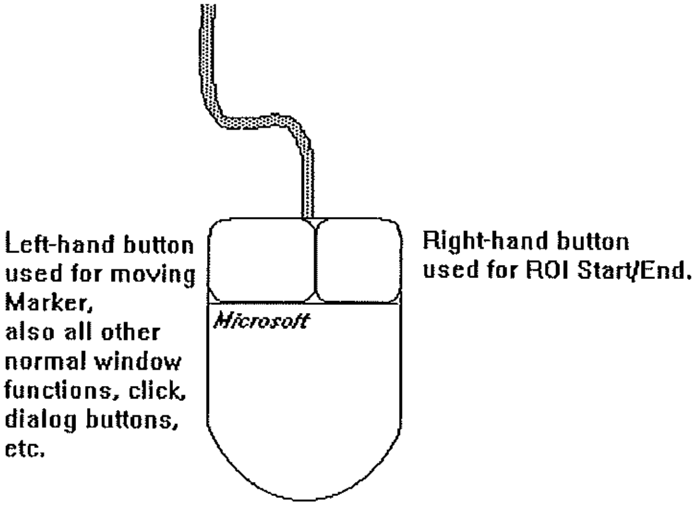

Left-hand button used for moving Marker, also all other normal window functions, click, dialog buttons, etc.
Microsoft
Right-hand button used for ROI Start/End.

Fig. 4. Mouse Buttons.

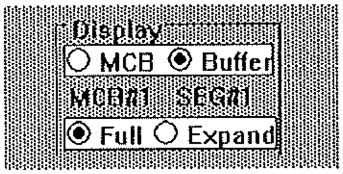
Note that whenever the marker is moved with the mouse while the display is in FULL mode, the EXPAND area is re-centered at the marker channel when the motion is completed (i.e., when the left mouse button is lifted.) However, in EXPAND mode, the display is not re-centered (but can be by pressing the Keypad<5> key if desired.) This is not true of the corresponding keyboard functions <←>/<→> for moving the cursor, in which case the EXPAND display is always centered on top of the marker. (The only exception is when the marker is too close to the end of the full spectrum, in which case it will not be centered.)

Depressing the right mouse button (together with the left button) while the pointer is moved in the Spectrum window allows a Region-Of-Interest (ROI) to be marked very easily. All channels from the point at which the right mouse button is first depressed to the point at which it is released are marked inclusively as an ROI.

The mouse can be used to access the top-level menus and work with the dialogs described later in this manual. In addition, the radio buttons and scaling buttons in the Status area can be accessed directly with the mouse to switch between MCB and Buffer and between FULL and EXPAND, and to adjust the horizontal and vertical scaling. And while the Buffer is displayed, the special indexing buttons in the overlay at the lower part of the Status area can be accessed to perform peak searches, ROI searches, library or segment changes in the designated directions.

4.3. Display Buttons

Radio buttons at the top of the Status window are provided to switch between MCB and Buffer or between FULL and EXPAND modes.



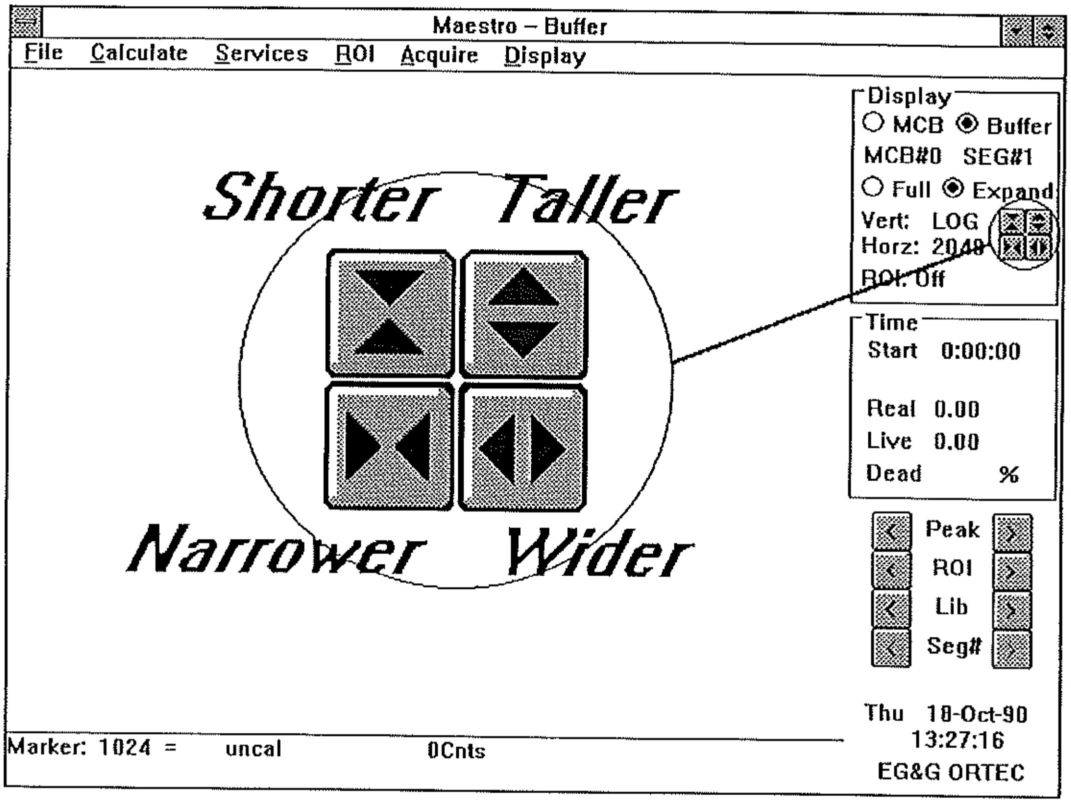
○ MCB ● Buffer

MCB#1 SEG#1

● Full ○ Expand

Fig. 5. Radio Buttons.

Scaling buttons (Fig. 6) with special symbols are provided next to the Vertical and Horizontal scale readings near the top of the Status window for adjusting the respective scales up or down by factors of two.



○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Start 0:00:00
Real 0.00
Live 0.00
Dead %

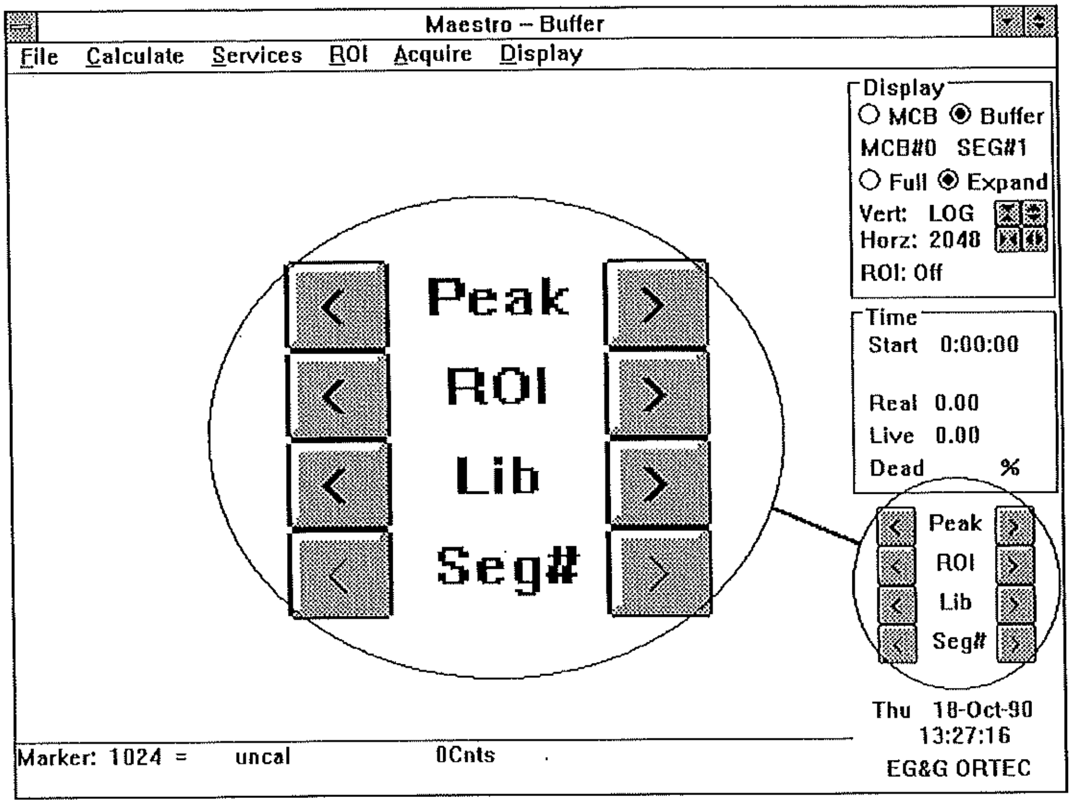
Marker: 1024 = uncal 0Cnts

Thu 18-Oct-90
13:27:16
EG&G ORTEC

Fig. 6. Scaling Buttons.

These Scaling buttons duplicate the functions of DISPLAY menu "Wider," "Narrower," "Taller," and "Shorter," and various keyboard accelerators such as <F5>/<F6>, <F7>/<F8>, etc. (Refer to descriptions of these functions in Section 5 for details that apply to all scaling changes.)

While the Buffer is displayed, special **Indexing buttons** (Fig. 7) are overlaid onto the bottom of the Status area (where the Presets normally appear in MCB display mode). These buttons are useful for rapidly locating peaks or ROIs and for advancing between entries in the library, or for skipping between segments. Whenever one of these functions is not available (such as when no library is present, or if the memory is not segmented), the corresponding button is disabled and shown in gray.



○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Start 0:00:00
Real 0.00
Live 0.00
Dead %

Thu 18-Oct-90
13:27:16
EG&G ORTEC

Marker: 1024 = uncal 0Cnts

Fig. 7. Indexing Buttons.

The PEAK and ROI indexing buttons should be fairly self-explanatory, and duplicate the functions of <Ctrl+ ←>/<Ctrl+ →> and <Shift+ ←>/<Shift+ →>, described elsewhere, for rapidly locating peaks and ROIs. The SEG buttons are also self-explanatory and duplicate the <Shift+ PgUp> and <Shift+ PgDn> keys described elsewhere for changing segments. The LIB indexing buttons duplicate the functions of <Alt+ ←>/<Alt+ →>, described elsewhere, and are useful after a peak has been located to advance forward or backward through the nuclide library to the next closest library entries. Each button press advances to the next library entry and moves the marker to the corresponding energy. Also, instead of indexing from a previously identified peak, the marker may be positioned anywhere in the spectrum and the LIB key used to locate the entries closest in energy to that point. If a warning is sounded (beep), it means that all library entries have been exhausted in that direction, or that the spectrum is not properly calibrated for reaching the energy with the marker. In any case, if an appropriate peak is available at the location of the marker, data on the peak activity are displayed.

5. KEYBOARD FUNCTIONS

The keys described in this section are grouped primarily according to location on the keyboard and secondarily by related function.

5.1. Function Descriptions

5.1.1. Multikey Functions

Multikey functions, such as <Alt+ 1>, <Shift+ →>, etc., are executed by holding down the first key (e.g., <Alt>, <Shift>, and/or <Ctrl>) while pressing the designated key of the keyboard or keypad. All keyboard and keypad functions are summarized in Fig. 8 and Table 1.

5.1.2. Menu Keys

As usual for any Windows application, the menu mode is attained by pointing at the menu bar with the mouse and clicking, or by pressing (and releasing without depressing a second key) the <Alt> key. Note that the keys and/or accelerators used by MAESTRO do not interfere with the normal function of Windows menu operations, task switching, etc. For example, while accessing top-level menus, the RightArrow <←> and LeftArrow <→> keys and the UpArrow <↑> and DownArrow <↓> keys revert to their normal functions of switching along the menu bar and up and down within a menu, respectively.

5.1.3. Active Window

The key functions documented here are available only so long as MAESTRO is the *active* window, and the spectrum display has the *input focus*, as indicated by the fact that the Title Bar is highlighted in a different color (this is a characteristic of Microsoft Windows). Under Windows, the input focus can be switched among applications by the use of the <Alt+ Esc> key combination, or (if the inactive window is visible) by pointing with the mouse at some place in the inactive window and clicking.

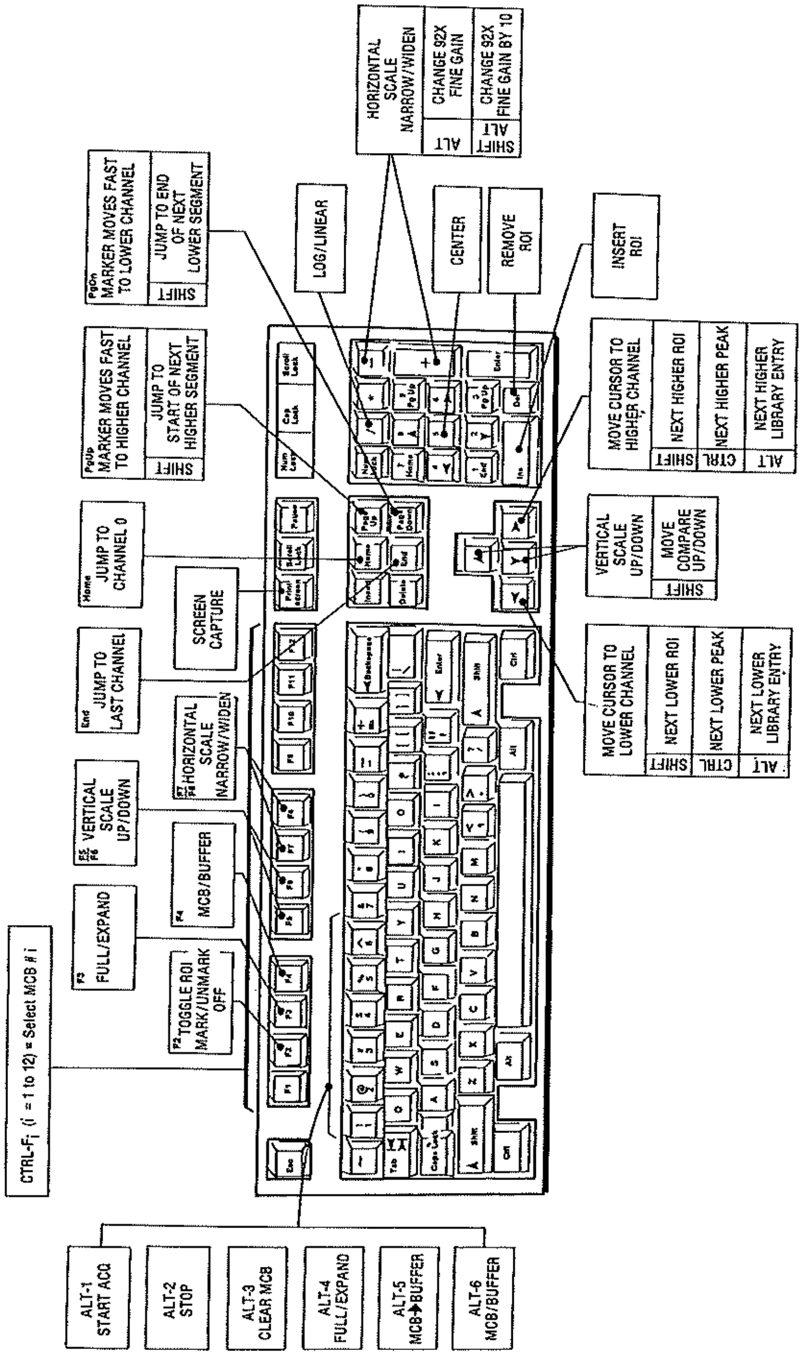

ALT-1 START ACQ
ALT-2 STOP
ALT-3 CLEAR MCB
ALT-4 FULL/EXPAND
ALT-5 MCB→BUFFER
ALT-6 MCB/BUFFER
CTRL-F$_i$ (i = 1 to 12) = Select MCB # i
F2 TOGGLE ROI MARK/UNMARK OFF
F3 FULL/EXPAND
F4 MCB/BUFFER
F5 F6 VERTICAL SCALE UP/DOWN
F7 F8 HORIZONTAL SCALE NARROW/WIDEN
End JUMP TO LAST CHANNEL
SCREEN CAPTURE
Home JUMP TO CHANNEL 0
PgUp MARKER MOVES FAST TO HIGHER CHANNEL
SHIFT JUMP TO START OF NEXT HIGHER SEGMENT
PgDn MARKER MOVES FAST TO LOWER CHANNEL
SHIFT JUMP TO END OF NEXT LOWER SEGMENT
LOG/LINEAR
HORIZONTAL SCALE NARROW/WIDEN
ALT CHANGE 92X FINE GAIN
SHIFT ALT CHANGE 92X FINE GAIN BY 10
CENTER
REMOVE ROI
INSERT ROI
MOVE CURSOR TO HIGHER CHANNEL
SHIFT NEXT HIGHER ROI
CTRL NEXT HIGHER PEAK
ALT NEXT HIGHER LIBRARY ENTRY
VERTICAL SCALE UP/DOWN
SHIFT MOVE COMPARE UP/DOWN
MOVE CURSOR TO LOWER CHANNEL
SHIFT NEXT LOWER ROI
CTRL NEXT LOWER PEAK
ALT NEXT LOWER LIBRARY ENTRY

Fig. 8. Keyboard.

Table 1. Keyboard (including Menu Accelerators).

Key	Function
<↓> or <F5>	Change vertical scale so that spectrum peaks are smaller
<↑> or <F6>	Change vertical scale so that spectrum peaks are larger
<→>	Move marker to higher channel
<←>	Move marker to lower channel
<Ctrl+ →>	Jump to next higher peak
<Ctrl+ ←>	Jump to next lower peak
<Shift+ →>	Jump to next higher ROI
<Shift+ ←>	Jump to next lower ROI
<Alt+ →>	Advance to next library entry
<Alt+ ←>	Recede to previous library entry
<PageUp>	Jump to much higher channel number (within segment)
<PageDown>	Jump to much lower channel number (within segment)
<Shift+ PageUp>	Jump to beginning of next segment
<Shift+ PageDown>	Jump to end of next lower segment
<Home>	Jump to first channel of the displayed segment
<End>	Jump to last channel of the displayed segment
<Ctrl+ Fi>	Select MCB #i (i = 1 to 12)
<F2>	Switch ROI bit control from OFF to SET to CLEAR
<F3> or <Alt+ 4>	Switch between displaying FULL and EXPAND display
<F4> or <Alt+ 6>	Switch between displaying selected MCB and Buffer
<F5> or <↓>	Change vertical scale so that spectrum peaks are smaller
<F6> or <↑>	Change vertical scale so that spectrum peaks are larger
<F7> or Keypad<->	Narrow the horizontal scale
<F8> or Keypad<+>	Widen the horizontal scale
Keypad <5>	Center expanded display on cursor
Keypad </>	Toggle between logarithmic and linear vertical scale
Insert <Ins>	Mark the peak region around the cursor as an ROI
Delete <Del>	Clear the ROI
<Shift+ ↑>	Shift the COMPARE spectrum upwards
<Shift+ ↓>	Shift the COMPARE spectrum downwards
<Alt+ 1>	Start acquisition in selected MCB
<Alt+ 2>	Stop acquisition in selected MCB
<Alt+ 3>	Clear data and descriptors in selected MCB
<Alt+ 4> or <F3>	Switch between displaying FULL and EXPAND display
<Alt+ 5>	Copy data in the selected MCB to the internal Buffer
<Alt+ 6> or <F4>	Switch between displaying selected MCB and Buffer
<Alt+ ->	Decrease 92X amplifier fine gain by smallest increment
<Shift+Alt+ ->	Decrease 92X amplifier fine gain by ten increments
<Alt+ +>	Increase 92X amplifier fine gain by smallest increment
<Shift+Alt+ +>	Increase 92X amplifier fine gain by ten increments
<PrintScreen>	Capture screen to Windows Clipboard

5.2. Marker and Display Function Keys

5.2.1. Next Channel <→>/<←>

The Right and Left Arrow keys move the marker by one displayed pixel in the corresponding direction. This may represent a jump of more than one spectral data memory channel, especially if the horizontal scale in channels is larger than the width in pixels of the window.

If the ROI mode is set to "MARK", these keys cause all channels to be marked inclusively. Similarly, ROI bits are cleared while the ROI mode is "UNMARK". (See section 5.4.1.)

5.2.2. Next ROI <Shift+ →>/<Shift+ ←>

The <Shift+ →> or <Shift+ ←> move the marker to the beginning of the next higher channel ROI, or the end of the preceding ROI, respectively, of the active Segment in the Buffer or the MCB. In FULL mode, the entire display is used (i.e., the search crosses segment boundaries). In BUFFER mode, these functions are duplicated by the ROI indexing buttons overlaid on the bottom of the Status window.

5.2.3. Next Peak <Ctrl+ →>/<Ctrl+ ←>

The <Ctrl+ →> and <Ctrl+ ←> performs a peak search on the spectrum in the higher (or lower, respectively) channel direction and moves the marker to the first peak found. If no peak is found, the program displays a message ("No More Peaks") and the marker does not move. If the spectrum has been energy-calibrated, and the library (e.g., LIB.MCB) has been loaded, the system displays the best match from the library within two FWHMs of the peak centroid. If there is no match within this range, then a message ("No Close Library Match") is displayed. In BUFFER mode, these functions are duplicated by the PEAK indexing buttons overlaid on the bottom of the Status window.

5.2.4. Next Library Entry <Alt+ →>/<Alt+ ←>

The <Alt+ →> and <Alt+ ←> move forward or backward through the nuclide library to the next closest library entries. Each button press advances to the next library entry and moves the marker to the corresponding energy. Also, instead of indexing from a previously identified peak, the marker may be positioned anywhere in the spectrum and these keys used to locate the entries closest in energy to that point. If a warning is sounded (beep), it means that all library entries have been exhausted in that direction, or that the spectrum is not properly calibrated for reaching the energy with the marker. In any case, if an appropriate peak is available at the location of the marker, data on the peak activity are displayed. These functions are duplicated by the LIB indexing buttons overlaid on the bottom of the Status window in BUFFER mode.

5.2.5. First/Last Channel <Home>/<End>

These keys move the marker to the first or last channel of the displayed segment (if in EXPAND mode), or to the first or last channel of the entire spectral memory (if in FULL mode), respectively.

5.2.6. Jump <PageDown>/<PageUp>

<PageDown> or <PageUp> jumps the marker position to the data channels at a large distance to the left or the right, respectively. When the window is EXPANDED, the peak moves to the right or left of the display, respectively. The status of the ROI bit will not be altered when the marker is moved with these keys.

The marker channel contents are continuously updated. When the motion stops, the channel contents are up-to-date.

If the display is segmented and EXPANDED, the marker cannot be moved below channel 0 of the segment (see <Shift+ PageDown>), nor past the end of the segment (see <Shift+ PageUp>). In FULL mode, the cursor can cross the segment boundary.

5.2.7. Next Segment <Shift+ PageUp/PageDown>

These keys move the marker to the beginning of the next (higher) segment, or the preceding (lower) segment, respectively. If only one segment is defined, then no action is taken. In EXPANDED mode, <Shift+ PageUp> and <Shift+ PageDown> are the only ways to move from segment to segment. In BUFFER mode, these functions are duplicated by the SEG indexing buttons overlaid on the bottom of the Status window.

5.2.8. Insert ROI <Insert> or Keypad<Ins>

This key marks an ROI in the spectrum, at the marker position, in one of two ways:

1. If the spectrum is calibrated, the region is centered on the marker with a width of three times the calibrated FWHM. There does not need to be a peak at the marker position.
2. If the spectrum is not calibrated, the region is centered on the peak located within two channels of the marker and as wide as the peak. If the peak search fails, or if the peak is not well-formed, no ROI is marked. There is no limit on the size of a peak or ROI; therefore, in some uncalibrated spectra, large ROIs may be marked.

<Ins> works very conveniently in combination with <Ctrl+ ←> or <Ctrl+ →> to rapidly set peak ROIs.

5.2.9. Clear ROI <Delete> or Keypad<Del>

This key clears the ROI bits of all ROI channels contiguous with the channel containing the marker.

5.2.10. Vertical Scale <↑>/<↓>

The <↑> or <↓> keys decrease or increase the vertical full scale of the displayed spectrum so that the peaks appear taller or shorter, respectively. The minimum is 16-counts-full-scale; the maximum is 1024 million counts. Each successive key press will double or halve the full scale until the maximum or minimum is reached. Whenever the maximum full-scale value is reached, the next <↓> key press will switch to log scale. If the display is already in log scale, the display is switched to linear scale.

In either case, the vertical full-scale value is always shown in the Status area to the right of the Spectrum.

Note that if the number of counts exceeds the full-scale value, then the data points are displayed modulo the full-scale value. This means that data below the full scale are displayed at their value; data above the full scale have the full-scale value subtracted from them until the resultant value is below the full scale. This is also referred to as "wrap-around" or "rolling-over."

These keys duplicate the function of the <F6>/<F5> keys, respectively, as well as the pair of scaling buttons in the Status window next to the "Vert:" reading, and all three pairs are accelerators for the corresponding TALLER/SHORTER functions in the DISPLAY menu.

5.2.11. Expand/Contract Keypad<+>/Keypad<->

In FULL mode (see Section 6.2.2), Keypad<+> expands the width of the EXPAND area around the marker, while Keypad<-> contracts it. The window is delineated by the specially colored area. In EXPAND mode, Keypad<+> decreases the horizontal scale of the data display, so that the peaks become wider, while Keypad<-> performs the opposite function of making the peaks more narrow. These functions are duplicated by scaling buttons in the Status window, and by the <F7>/<F8> keys.

In any case, the horizontal scale value is always shown in the Status area to the right of the Spectrum.

5.2.12. Fine Gain (92X only) <Alt+ +>/<Alt+ ->

The <Alt+ +>/<Alt+ -> combinations will step the 92X internal amplifier up or down by one increment of fine gain on the selected MCB. The new setting of the fine gain is shown in the information line at the bottom of the screen. If the gain stabilizer is active, the display of the histogram data may not change.

The fine gain can also be set with the 92X CONTROL dialog, accessed under the ACQUIRE menu (refer to Section 6.1, for further details).

NOTE: Both the keyboard <+>/<-> and the keypad <+>/<-> keys will perform these functions. Also, on the keyboard, the <Alt+ +> combination is actually <Alt+ =>, (i.e., the <Shift> key is not required), and in fact would generate a different function (see below).

5.2.13. Gain (92X only) <Shift+Alt+ +/->

The <Shift+Alt+ +>/<Shift+Alt+ -> steps the 92X internal amplifier up or down by ten increments of fine gain on the selected MCB. The selected MCB, or active MCB, is shown in the upper right of the display. The new setting of the fine gain is shown in the message box at the bottom of the screen. If the gain stabilizer is active, the display of the histogram data may not change.

The fine gain can also be set with the "92X Control" dialog accessed under the ACQUIRE menu.

5.2.14. Screen Capture <PrintScreen>

The <PrintScreen> initiates a screen capture to the Windows Clipboard. The graphic image of the entire screen is deposited in the clipboard, and is available for later use by other applications such as word processors. Some older keyboards require <Alt+ PrintScreen> or <Shift+ PrintScreen>

A typical usage might be to set up the display as desired for the snapshot (use the "Color Preferences..." dialog to select black or white for all areas rather than colors, since they produce clearer printouts), then press <PrintScreen>, and exit MAESTRO. Then, load the Windows PaintBrush (or Windows Write) application and "Paste" the contents of the clipboard onto the screen with the "Edit" function (refer to Microsoft Windows documentation.) Then "Save" this, modify it, and/or "Print" it directly from this application.

5.3. Keyboard Number Combinations

NOTE: Only the key*board* numbers will function in the following combinations. The key*pad* number keys will not perform these functions.

5.3.1. Start <Alt+ 1>

The <Alt+ 1> combination will start the acquisition in the selected MCB. If any presets are desired, the presets must be entered before starting the acquisition. Refer to the corresponding ACQUIRE menu "Start" function (Section 6.1.3), which is duplicated by this accelerator, for more details.

5.3.2. Stop <Alt+ 2>

The <Alt+ 2> combination will stop the acquisition in the selected MCB. Refer to the corresponding ACQUIRE menu "Stop" function (Section 6.1.4), which is duplicated by this accelerator, for more details.

5.3.3. Clear <Alt+ 3>

The <Alt+ 3> combination will clear the displayed MCB's histogram data and its descriptors (real time, live time, etc.). Refer to the corresponding ACQUIRE menu "Clear" function (Section 6.1.5), which is duplicated by this accelerator, for more details.

5.3.4. Full/Expand <Alt+ 4>

The <Alt+ 4> combination will switch the display between the FULL and EXPANDED mode. The status of the display is shown in the upper right of the display. This duplicates the corresponding DISPLAY menu "Full/Expand" function; refer to the Section 6.2.2 for more details on this function. It is also performed by <F3> and by the radio buttons in the Status window.

5.3.5. Copy MCB > Buffer <Alt+ 5>

The <Alt+ 5> combination copies the histogram data from the selected MCB to the Buffer, along with its descriptors (live time, real time, etc.) Refer to the corresponding ACQUIRE menu "Copy MCB > Buffer" function (Section 6.1.6), which is duplicated by this accelerator, for more details.

5.3.6. MCB/Buffer <Alt+ 6>

The <Alt+ 6> combination will switch the display between the selected MCB and the Buffer. This duplicates the corresponding DISPLAY menu "MCB/Buffer" function; refer to Section 6.2.1 for more details on this function. This function is also performed by <F4> and by radio buttons in the Status window.

5.4. Function Keys

5.4.1. ROI <F2>

The <F2> key switches the ROI marker status among three conditions (Mark, Unmark or Off) for manipulating the ROI bits in the MCB memory or the data Buffer memory by the use of the marker. The current ROI marker status is always shown in the Status window to the right of the Spectrum. ROI bits are changed by using the keyboard to move the marker to a channel, and according to this status as follows:

Mark — The channel is marked (set) as an ROI with the marker

Unmark — The channel is removed from the ROI (reset) with the marker

Off — The ROI status is unchanged with the marker

5.4.2. Full/Expand <F3>

The <F3> key switches between FULL memory display and EXPANDED memory display and works on both the MCB and data Buffer memory.

This function is duplicated by the <Alt+ 4> combination and also by radio buttons in the Status window. In any case, the status of the display, whether FULL or EXPANDED, is shown by the radio buttons in the Status window to the right of the Spectrum.

5.4.3. MCB/Buffer <F4>

The <F4> key switches between the display of the data in the MCB and the data in the Buffer. The Buffer will have the memory size and segmentation of the spectrum that was last transferred from MCB or disk file.

The emulation displays the data in histogram form from either the selected MCB or the Buffer. The status of the display (whether MCB or Buffer) is shown by radio buttons in the Status area to the right of the spectrum. The Live Time, Real Time, (and Dead Time, for an acquiring MCB), and presets are shown for the displayed data. The marker remains in the same channel in both views unless the Buffer and MCB do not have the same segmentation. The FULL/EXPANDED status and the vertical scale are the same in both views.

For functions that work only on the Buffer data, the program automatically executes this function to switch to the Buffer.

This accelerator duplicates "Full/Expand" under the DISPLAY menu and can also be performed by <Alt+ 6> or by the radio buttons themselves.

5.4.4. Vertical Scale <F5>/<F6>

These keys increase or decrease the vertical full scale of the displayed spectrum so that the peaks appear shorter or taller, respectively. If the display is in log scale, the display is switched to linear scale. The minimum is 16-counts-full-scale; the maximum is 1024 million counts. Each successive key press will double or halve the full scale until the maximum or minimum is reached. Whenever the maximum full-scale value is reached, the next <F5> key press will switch to log scale.

In either case, the vertical full-scale value is always shown in the Status area to the right of the Spectrum.

Note that if the number of counts exceeds the full-scale value, then the data points are displayed modulo the full-scale value. This means that data below the full scale are displayed at vertical positions relative to the size of the window, while data above the full scale have the full-scale value subtracted from them until the resultant value displayed is below the full scale and lies within the window. This is also referred to as "wrap-around" or "rolling over."

These keys duplicate the function of the <↓> and <↑> keys, respectively. Further, the scaling buttons in the Status window next to "Vert:" duplicate these functions.

5.4.5. Horizontal Scale <F7>/<F8>

In FULL mode (see Section 6.2.2), these keys contract or expand the width of the EXPAND area around the marker, respectively. The EXPAND area is delineated by the colored area surrounding the marker. This window is the full width of the expanded data. In EXPANDED mode, these keys increase or decrease the horizontal scale of the data display so that the peaks become narrower or wider, respectively.

The Keypad <-> and Keypad <+> keys duplicate the function of <F7> and <F8>. Further, the scaling buttons in the Status window next to "Horz:" duplicate these functions.

In any case, the full horizontal scale (in channels) is shown in the Status window to the right of the Spectrum.

5.4.6. Select MCB <Ctrl+ F1> through <Ctrl+ F12>

These keys switch to the specified MCB #i (where i = 1 to 12, corresponding to <Ctrl+ Fi>), if that MCB was defined in the Configuration. If the Buffer is displayed, these keys also switch to MCB mode display.

The data display, presets and elapsed times are all updated when the MCB number is changed. The MCB selected is shown in the upper right of the screen. The Segment is selected by the position of the cursor.

These functions duplicate the function of the "Select MCB..." dialog under the DISPLAY menu, except that the user must be aware of which MCB numbers are available when using the keyboard functions. (An error message box appears if illegal MCB number selections are attempted).

6. MENU FUNCTIONS

Descriptions of all the top-level menu functions, and associated dialogs, follows. As is customary for Windows menus, the accelerator(s) (if any) are shown to the right of the menu function they duplicate. Also, the underlined letter indicates a key that can be used for quick access in the menu. (So, for example, the "Select MCB..." dialog under Display can be reached by the following key sequence: <Alt+ D>, <Alt+ M>.) Further, the "..." following a menu selection indicates that a dialog is invoked to complete the function. The top-level menus covered in this section, in the order that they appear on the menu bar are as follows:

File
    Recall...
    Save
    Save As...
    Print
    Report...
    Compare...
    Exit
    About MAESTRO...

Calculate
    Calibrate...
    Peak Search
    Sensitivity...
    Peak Info
    Peak Area
    FWXM...
    Sum...
    Smooth
    Strip...

Services
    JOB Control...
    Configuration...
    Sample...
    Detector...
    Library...

ROI

Mark	<F2> or <Alt+ O>
UnMark	<F2> or <Alt+ M>
Off	<F2> or <Alt+ U>
Begin	Right Mouse Down
End	Right Mouse Up
Clear All	
Save File...	
Recall File...	

Acquire

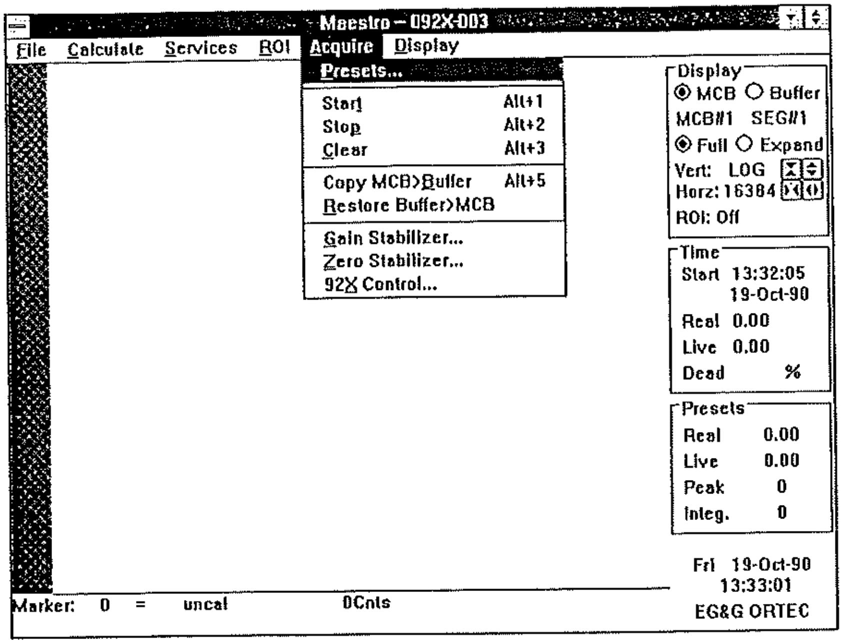
Presets...	
Start	<Alt+ 1>
Stop	<Alt+ 2>
Clear	<Alt+ 3>
Copy MCB>Buffer	<Alt+ 5>
Restore Buffer>MCB...	
Gain Stabilizer...	
Zero Stabilizer...	
92X Control...	

Display

MCB/Buffer	<F4> or <Alt+ 6>
Full/Expand	<F3> or <Alt+ 4>
Select MCB...	<Ctrl+ Fi> [i=MCB no.]
Logarithmic	Keypad</>
Shorter	<F5> or <↓>
Taller	<F6> or <↑>
Narrower	<F7> or Keypad<->
Wider	<F8> or Keypad<+>
Center	Keypad<5>
Points	
Fill ROI	
Fill All	
Color Preferences...	

6.1. Acquire

The Acquire menu is shown below. If the Buffer is on the display, the spectrum display is automatically switched to the selected MCB when this menu is selected, because these menu functions are valid only on an MCB/Segment. Several accelerators also duplicate these menu functions (as shown in the menu).



Display
◉ MCB ○ Buffer
MCB#1 SEG#1
◉ Full ○ Expand
Vert: LOG
Horz: 16384
ROI: Off

Time
Start 13:32:05
19-Oct-90
Real 0.00
Live 0.00
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Fri 19-Oct-90
13:33:01
EG&G ORTEC

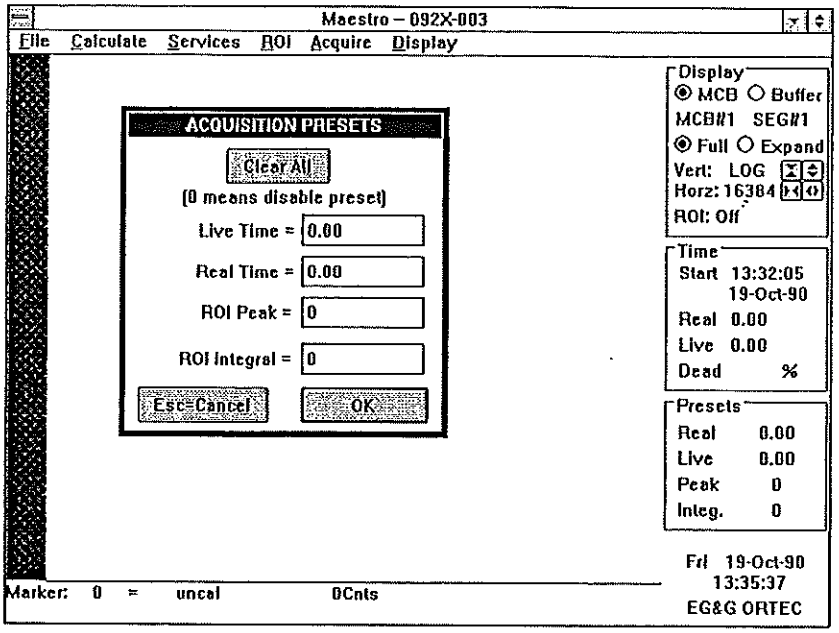
Marker: 0 = uncal 0Cnts

Fig. 9. Acquire Menu.

The Gain and Zero Stabilizer... options appear and are valid only when the active MCB (see upper right of display) will support this feature. The 92X CONTROL option is present and valid only when the active MCB is a 92X. If any of these options are "grayed," it means they are disabled for the current MCB, but are valid for some other MCB in the system; if the option is entirely absent, this indicates that there are no MCBs in the system for which that option is valid.

6.1.1. Preset...

When the Preset... function is selected, the dialog box shown in Fig. 10 appears. This function is available only on MCB/Segments which are not already acquiring data.



(0 means disable preset)

Live Time = 0.00

Real Time = 0.00

ROI Peak = 0

ROI Integral = 0

● MCB ○ Buffer

MCB#1 SEG#1

● Full ○ Expand

Vert: LOG

Horz: 16384

ROI: Off

Start 13:32:05 19-Oct-90

Real 0.00

Live 0.00

Dead %

Real 0.00

Live 0.00

Peak 0

Integ. 0

Fri 19-Oct-90 13:35:37

EG&G ORTEC

Marker: 0 = uncal 0Cnts

Fig. 10. Preset Dialog.

The **Real Time** and **Live Time** entry fields are used to enter the real-time and live-time presets, respectively (in units of seconds and fractions-of-a-second). The values are stored internally with a resolution of 20 milliseconds, since the MCB clock increments by 20 ms. *Real time* means elapsed time or clock time. *Live time* refers to the amount of time that the MCB is available to accept another pulse (i.e., it was not busy), and is equal to the Real time minus the "Dead time".

The **Peak Count** entry field is used to enter the ROI Peak Count preset (in counts). With this preset condition, the MCB stops counting when any ROI channel reaches this value, unless there are no ROIs are marked in an MCB/Segment, in which case that MCB/Segment can never encounter this condition.

The **Integral** entry field is used to enter the ROI Integral preset value (in counts). With this preset condition, the MCB stops counting when the sum of all counts in all channels in this Segment marked with an ROI reaches this value, unless no ROIs are marked in the MCB/Segment.

Any preset with a value of 0 is disabled (i.e., has the same meaning as "infinity"). The **Clear All** field is supplied to effectively disable any preset condition whatsoever; in this case the acquisition continues until manually terminated.

Any or all of the presets may be enabled simultaneously. When more than one preset is set to a non-zero value, the first condition met during the acquisition causes the MCB to stop. This can be useful when samples of widely varying activity are analyzed and the general activity is not known before counting. For example, the live-time preset can be set so that sufficient counts can be obtained for proper calculation of the activity in the sample with the least activity. But if the sample contains a large amount of this or another nuclide, then the dead time can be high, resulting in a long counting time for the sample. By setting the Peak-Count preset in addition to the live-time preset, the low-level samples will be counted to the desired fixed live time while the very active samples will be counted for the Peak Count; thus, the Peak-Count preset could be viewed as a "safety valve."

In a segmented MCB, all the Segments are affected if the display is in FULL mode when the presets are set. In EXPANDED mode, only the presets for the selected Segment are updated.

The values of all presets currently loaded into the selected MCB/Segment is shown in the Status window to the lower right of the Spectrum display. These values are not affected while the values are being entered into the dialog box or if the dialog box is CANCELled, but are, of course, modified if the values are changed in the dialog box and then OK'd.

6.1.2. Internal 919/920/921/92X TIME-OF-DAY clock

An automatic function of the **Presets...** dialog is to set the date/time for those MCBs equipped with internal time-of-day clocks. This is performed automatically on the selected MCB, whenever the presets are changed from this dialog. The date/time is obtained from the computer's own setting.

6.1.3. Start

The **Start** function initiates data collection in the selected MCB. If the MCB is segmented and the display is in FULL mode, all the Segments are started. If in EXPANDED mode, only the Segment displayed is started. Any warnings arising from problems detected at the hardware level will appear in a message box. Remember that the MCB can also be started by <Alt+ 1>, an accelerator that duplicates this function.

When an MCB acquisition is started, the appropriate .STR start record(s) are written unless the MCB is a 919/92X-type (with its own internal battery backed up RAM), in which case the current DOS system clock time-of-day is transferred to the MCB and remembered.

6.1.4. Stop

The **Stop** function terminates data collection in the selected MCB. The display must be in MCB mode (see Section 6.2). If the MCB is segmented, and the display is in FULL mode, all the Segments are stopped (see Section 6.2). If in EXPANDED mode, only the Segment displayed is stopped. If the MCB is not active, no operation occurs. The MCB can also be stopped by the accelerator <Alt+ 2>.

6.1.5. Clear

The **Clear** function erases the MCB spectral data, and also the descriptors (real time, live time, start time, etc.) for all the Segments in the display for the selected MCB. If the MCB is segmented, and the display is in FULL mode, all the Segments are cleared. If the system is in EXPANDED mode, only the displayed Segment is cleared. The presets are not altered. This function may not operate on some types of MCBs when they are collecting data. The data can also be cleared by <Alt+ 3>.

6.1.6. Copy MCB > Buffer

The Copy function transfers data, and also the descriptors (live time, real time, etc.), from the selected MCB to the Buffer. If the display is in FULL mode, all the data are transferred whether the MCB is segmented or not. If the display is expanded and segmented, only the active Segment is transferred. If the MCB is not segmented, all the data are transferred in EXPANDED mode. The active Segment is the Segment with the marker, as indicated in the Status window to the right of the Spectrum. This function is also performed by <Alt+ 5>.

6.1.7. Restore Buffer > MCB

The Restore function copies the contents of the Buffer to the active MCB. In FULL mode the entire Buffer is copied. In EXPANDED mode, only the active Segment is copied. In any case, the memory size transferred must be the same for the Buffer and MCB. This function always asks the user for confirmation before proceeding. If the user OKs the operation, the old data in the MCB are lost. The descriptors (live time, real time and possibly start time if the MCB stores this internally) are also written from the Buffer into the MCB.

Note that, for the 916/17/18-type MCBs which do not have the capability of internally storing the start time and date, appropriate .STR start record(s) are written, just as for the "Start" function.

6.1.8. Gain Stabilizer...

The **Gain Stabilizer...** function (see Fig. 11) allows the user to control the gain stabilizer on the 919 and 92X MCBs. The gain stabilizer requires a peak in the spectrum to monitor the changes in the gain of the system amplifier. The gain stabilizer controls the amplification factor of a separate amplifier so that the peak will be maintained in its original position. The input pulse height to channel number relationship is

$$\text{Channel number} = \text{Intercept} + \text{Gain} \cdot \text{pulse height} ,$$

where:

Intercept = the channel number of the zero-height input pulse;
Gain = the relation between pulse height and channel number (slope of the curve).

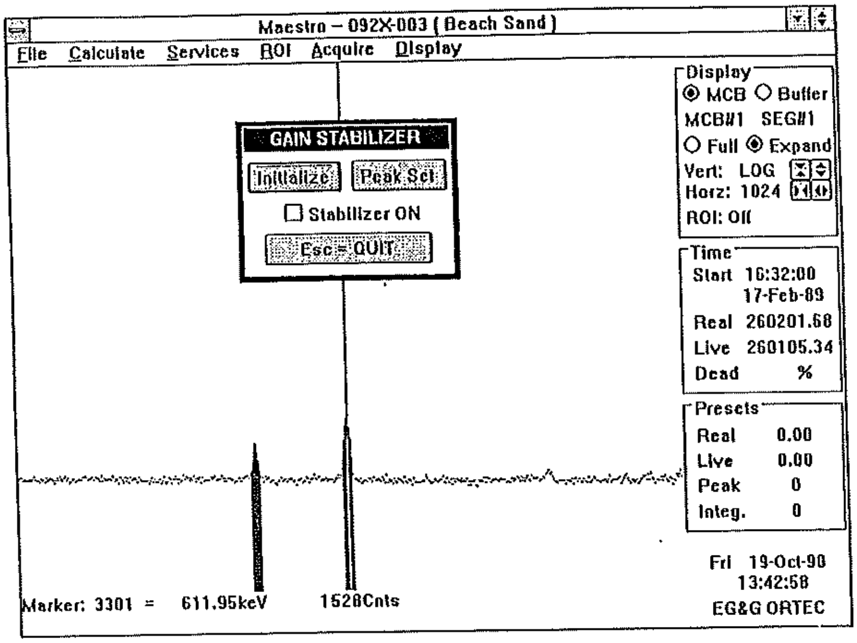
Changes in either the intercept or gain can affect the positions of all the peaks in the spectrum. When used with the zero stabilizer, both the zero intercept and the gain (slope) will be monitored to keep all the peaks in the spectrum stabilized. The zero stabilization and gain stabilization are separate functions in the MCB but both will affect the position of the peaks in the spectrum.

The stabilization operates by keeping a peak centered in an ROI defined by the user. The ROI should be made symmetrically about the center of a peak with reasonably good count rate in the higher channels of the spectrum. The ROI should be about twice the FWHM of the peak. If the region is too large, then counts not in the peak will have an effect on the stabilization. The ROI can be cleared after the PEAK command, if needed (e.g., so that peak count preset can be used on another peak).

The coarse and fine gains should be set to the desired values, both stabilizers initialized, and the pole zero should be triggered before setting either stabilization peak. On the 92X this is done with the "92X Control..." dialog (under ACQUIRE); for the 919 this is done externally.

The **Initialize** dialog push button sets the gain on the stabilization amplifier to its midpoint; that is, halfway between minimum gain and maximum gain. This should be done before selecting the ROI for the peak, as this may move the peak in the spectrum, and to ensure that the maximum range is available for the stabilization process. If the peak is moved by this command, use the amplifier fine gain control to move the peak to the desired channel (<Alt+ -> or <Alt+ +> on the 92X).

When starting a new system, the zero initialize command should also be done before starting the gain stabilization.



Display
● MCB ○ Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Fri 19-Oct-90
13:42:58
EG&G ORTEC

Marker: 3301 = 611.95keV 1528Cnts

Fig. 11. Control of the Gain Stabilizer.

The **Peak Set** dialog push button is used to set the peak center and peak width of the peak area used by the stabilizer. Before selecting this command, the ROI must be marked and the marker put in the region to be used. When operating, the peak will be centered in the ROI. After the region has been recorded the stabilization is turned on. If the stabilization is turned on when this command is executed, the old stabilization region is replaced by the new peak defined by the marker and stabilization continues using the new peak.

The **Stabilizer ON** checkbox enables or disables the gain stabilization. It can only be turned ON after the Peak Set push button has been used to select a working peak.

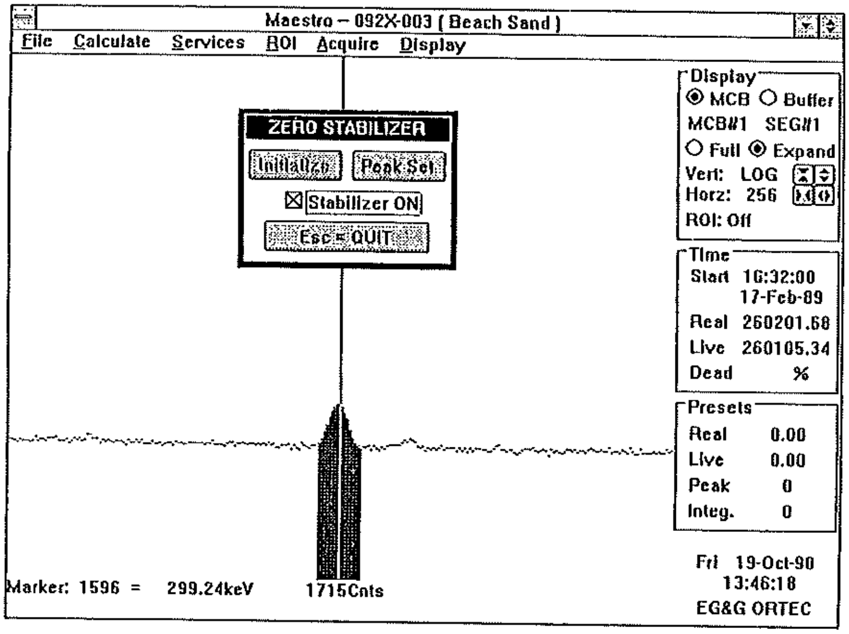
6.1.9. Zero Stabilizer...

The **Zero Stabilizer...** function (see Fig. 12) enables the user to control the zero-level (or offset) stabilizer on the 919 and 92X MCBs. The zero level stabilizer uses a peak in the spectrum to monitor the changes in the zero level of the system amplifier. The zero stabilizer controls offset bias level so that the peak will be maintained in its original position. The input pulse height to channel number relationship is

$$\text{Channel number} = \text{Intercept} + \text{Gain} \cdot \text{pulse height} \quad ,$$

where

Intercept = the channel number of the zero-height input pulse,
Gain = the relation between pulse height and channel number (slope of the curve).



☒ Stabilizer ON

Display
● MCB ○ Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 256
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Marker: 1596 = 299.24keV 1715Cnts

Fri 19-Oct-90
13:46:18
EG&G ORTEC

Fig. 12. Control of the Zero Stabilizer.

Changes in either the zero intercept or gain can affect the positions of all the peaks in the spectrum. When used with the gain stabilizer, both the zero intercept and the gain (slope) will be monitored to keep all the peaks in the spectrum stabilized. The zero stabilization and gain stabilization are separate functions in the MCB but both will affect the position of the peaks in the spectrum.

The stabilization operates by keeping a peak centered in an ROI defined by the user. The ROI should be made symmetrically about the center of a peak with reasonably good count rate in the lower channels of the spectrum. The ROI should be about twice the FWHM of the peak. If the region is too large, then counts not in the peak will have an effect on the stabilization. The ROI can be cleared after the PEAK command, if needed (e.g., so that peak count preset can be used on another peak).

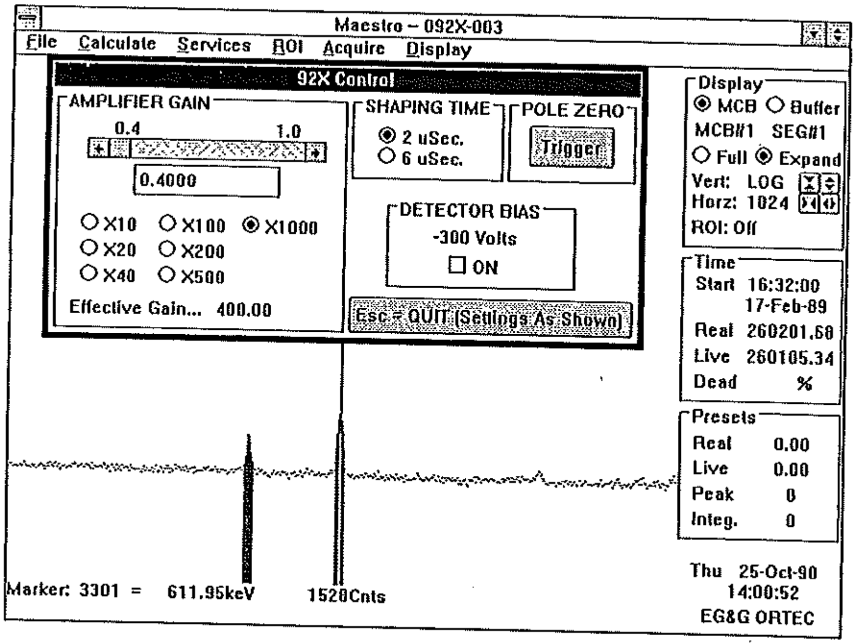
The zero stabilization dialog **Initialize** push-button command sets the zero offset to its midpoint; that is, halfway between minimum offset and maximum offset. This should be done before selecting the ROI for the peak, as this may move the peak in the spectrum, and to ensure that the maximum range is available for the stabilization process. If the peak is moved by this command, use the amplifier fine gain control to move the peak to the desired channel (<Alt+ -> or <Alt+ +> on the 92X).

The **Peak Set** push button is used to set the peak center and peak width of the peak area used by the stabilizer. Before selecting this command, the ROI must be marked and the marker put in the region to be used. When operating, the peak will be centered in the ROI. After the region has been recorded the stabilization is turned on. If the stabilization is turned on when this command is executed, the old stabilization region is replaced by the new peak defined by the marker and stabilization continues using the new peak.

The **Stabilizer ON** checkbox enables or disables the zero stabilization. It can only be turned ON after the Peak Set push button has been used to select a working peak.

6.1.10. 92X Control...

The 92X Control... function brings up the dialog shown in Fig. 13. The current amplifier gain and shaping time, high voltage, and automatic pole zero trigger are shown and can be changed for the currently selected 92X device. (Note that the menu item is "grayed;" i.e., this dialog is unavailable, whenever a non-92X MCB is selected.) NOTE also that the changes effected in this dialog TAKE PLACE IMMEDIATELY, and so the "Esc" push button means simply that you are finished making changes.



AMPLIFIER GAIN
0.4 1.0
0.4000
○ X10 ○ X100 ● X1000
○ X20 ○ X200
○ X40 ○ X500
Effective Gain... 400.00

SHAPING TIME
● 2 uSec.
○ 6 uSec.

POLE ZERO

DETECTOR BIAS
-300 Volts
☐ ON

Display
● MCB ○ Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.60
Live 260105.34
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Marker: 3301 = 611.95keV 1520Cnts

Thu 25-Oct-90
14:00:52
EG&G ORTEC

Fig. 13. 92X Control Dialog.

The **AMPLIFIER GAIN** section controls the 92X amplifier gain. The coarse gain is set with the radio buttons. The fine gain is set with the scroll bar, or with the edit box, in the range of 0.4000 to 1.0000. Coupled with the possible coarse gain settings, the entire range of amplification from 4.0 to 1000.0 is covered.

The **SHAPING TIME** radio buttons are used to select the 92X amplifier pulse shaping time constant. These values cover the time constants needed for high count-rate and high-resolution systems.

The 92X high voltage can be enabled or disabled by MAESTRO using the "ON" checkbox in the **DETECTOR BIAS** section. This function is overridden by the detector bias remote shutdown signal from the detector; high voltage cannot be enabled if the remote shutdown or overload signals prevent it. The voltage level is displayed in this section, but cannot be modified from the dialog; it is controlled by the hardware and is adjusted by a potentiometer on the rear panel (see hardware manual). The polarity is set with an internal jumper.

The **POLE ZERO** section is used for activation of the Amplifier Pole Zero Trigger. The 92X amplifier is equipped with an automatic pole zero circuit. If transistor reset preamplifier was selected for this 92X (in the configuration), then this option is not available ("grayed").

As with any system, the amplifier should be pole zeroed anytime the detector is changed, the shaping time of the amplifier is changed or the power to the module is turned off. The pole zeroing operation requires the amplifier to be amplifying pulses. The detector should be connected in the final configuration before pole zeroing is started. There should be a radioactive source near the detector so that the count rate will be high enough to accomplish the pole zero in the proper time.

Select the Pole Zero trigger option and press <Enter>. The pole zero command is sent to the 92X at this time and, if the 92X is able to start the pole zero operation, a series of short beeps is sounded to indicate that the pole zero is in progress. When the pole zeroing is finished, the beeps stop.

Without an oscilloscope (connected to the amplifier output) to see the pulse shape, the effect of the pole zero operation is not always easy to see. The most common effect of an incorrect pole zero setting is tailing on the peak shape in the spectrum. Here, tailing refers to abnormally high counts on either side of the peak. If the amplifier was close to properly pole zeroed before the operation, the spectrum peak shape may not change enough to be seen.

6.2. Display

The Display menu is shown below. The Display functions are available for either the internal Buffer or the MCB/Segment. Two of the most important functions of the MAESTRO program are to display the spectrum data and to provide an easy and straightforward way to manipulate the data. The display can be controlled by functions in this menu and by single function keys (accelerators).

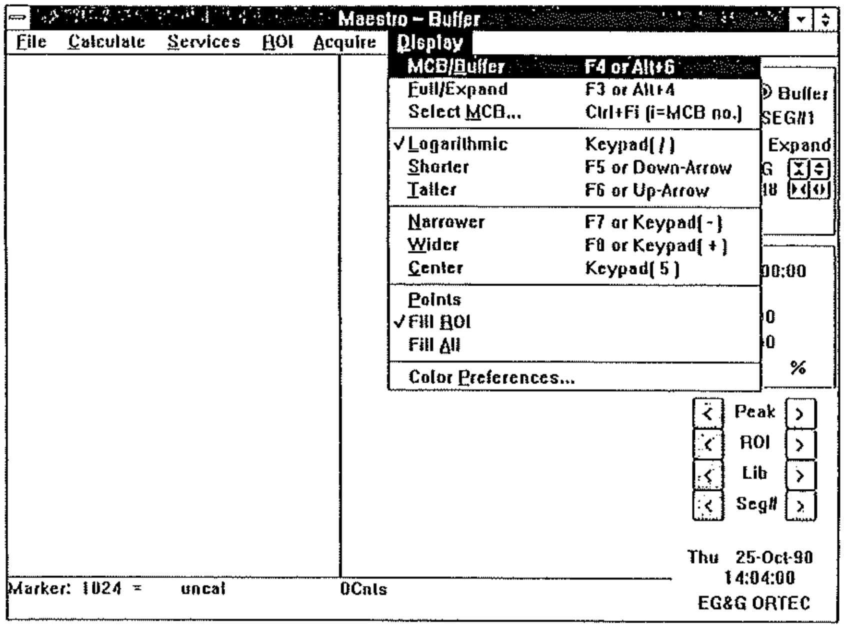


Fig. 14. Display Menu.

6.2.1. MCB/Buffer

This function switches the source of the Spectrum and Status display between the MCB and Buffer.

The Spectrum window displays the data in histogram form from either the selected MCB or the Buffer. The source of the displayed spectrum (whether MCB or Buffer) is shown by the radio buttons in the Status window to the right of the Spectrum. The corresponding descriptors (live time, real time, and dead time [for an active MCB only] and start time) as well as the presets are shown in the Status window for the spectrum. The marker remains in the same channel in both views unless the Buffer and MCB do not have the same segmentation or memory size. The FULL/EXPANDED status and the vertical scale remain the same in both views.

For menu functions that work only on either the Buffer or MCB data, the program automatically performs this function such that the correct data is selected. This function is duplicated by the accelerators <Alt+ 6> or <F4>.

6.2.2. Full/Expand

This function switches the Spectrum window between FULL and EXPANDED memory display and works on both the MCB and Buffer.

The cursor is centered in the EXPANDED area if possible. The width of the EXPANDED area can be adjusted by <F7>/<F8> or by Keypad<-> / Keypad<+>.

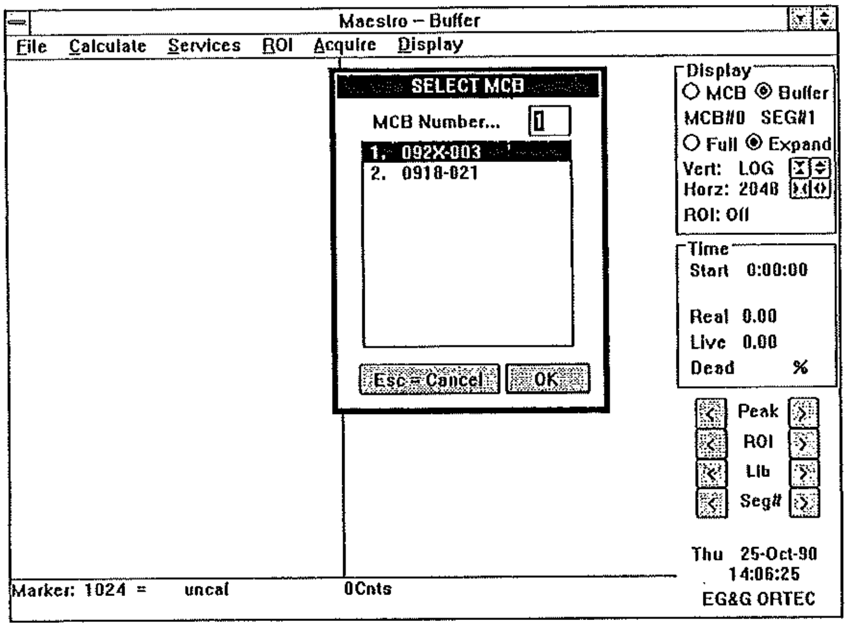
The status of the Spectrum display, whether FULL or EXPANDED, is always indicated by the radio buttons in the Status area to the right of the Spectrum window.

This function is duplicated by these radio buttons and also by the <F3> and <Alt+ 4> accelerators.

6.2.3. Select MCB...

This dialog (see Fig. 15) is used to select the MCB from the current configuration for display. The MCBs are selected by number (as established in the Configuration), and a description (obtained as the version identification from the MCB) is also displayed in the list for reference.

The MCB can also be selected by <Ctrl+ F1> for MCB #1, <Ctrl+ F2> for MCB #2, and so on, through <Ctrl+ F12>.



MCB Number... 1

1. 092X-003
2. 0918-021

Display
○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Time
Start 0:00:00
Real 0.00
Live 0.00
Dead %

Thu 25-Oct-90
14:06:25
EG&G ORTEC

Marker: 1024 = uncal 0Cnts

Fig. 15. Select MCB Dialog.

6.2.4. Logarithmic

This function is used to toggle the vertical scale of the Spectrum display between the logarithmic and linear mode. A check mark next to this selection in the menu box indicates if the logarithmic mode is enabled, as does the appearance of "LOG" for the vertical scale in the Status window.

This function is duplicated by Keypad</>. Also, the linear scale is automatically selected by <F5>/<F6>, <↓>/<↑>, or by Shorter/Taller, below.

6.2.5. Shorter/Taller

These functions switch the Spectrum display to a linear vertical scale and increase or decrease the full-scale value by a power of two, respectively. In either case, the current vertical full-scale value is shown in the Status window to the right of the Spectrum.

These functions are duplicated by the <F5>/<F6> or <↓>/<↑> keys, and by the scaling buttons in the Status window.

6.2.6. Narrower/Wider

These functions change the horizontal full scale of the Spectrum window by a factor two so that the peaks appear narrower or wider. In either case, the horizontal scale is shown in the Status window.

These functions are duplicated by the <F7>/<F8> or Keypad<->/Keypad<+> keys and by the scaling buttons in the Status window.

6.2.7. Center

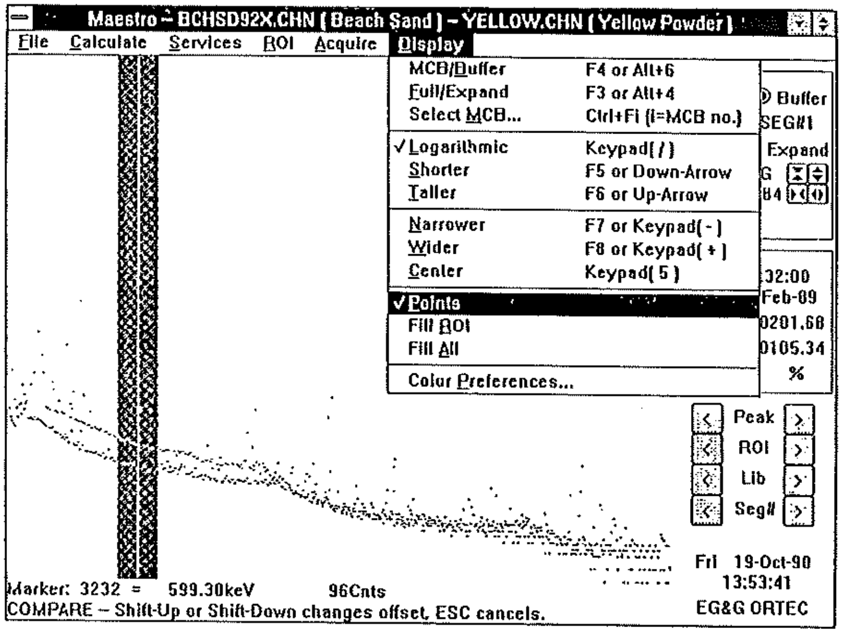
This function is provided to force the marker to the center of the screen (the spectrum is shifted so that the marker stays in the same channel). This function is only required if the marker is moved using the mouse, and if it is desired to have it centered (not really necessary). The keyboard functions for moving the marker perform this function automatically. This function is duplicated by Keypad<5>.

6.2.8. Points / Fill ROI / Fill All

These functions are used to select the histogram display mode, and are mutually exclusive; exactly one display mode is enabled at any time, as indicated by the check mark in this menu.

Examples of the display for each of these three modes are shown in the following figures, and the reason for the nomenclature should be evident. "Fill" refers to the solid shaded areas below the points, producing a bar-graph type of histogram for the feature being filled in.

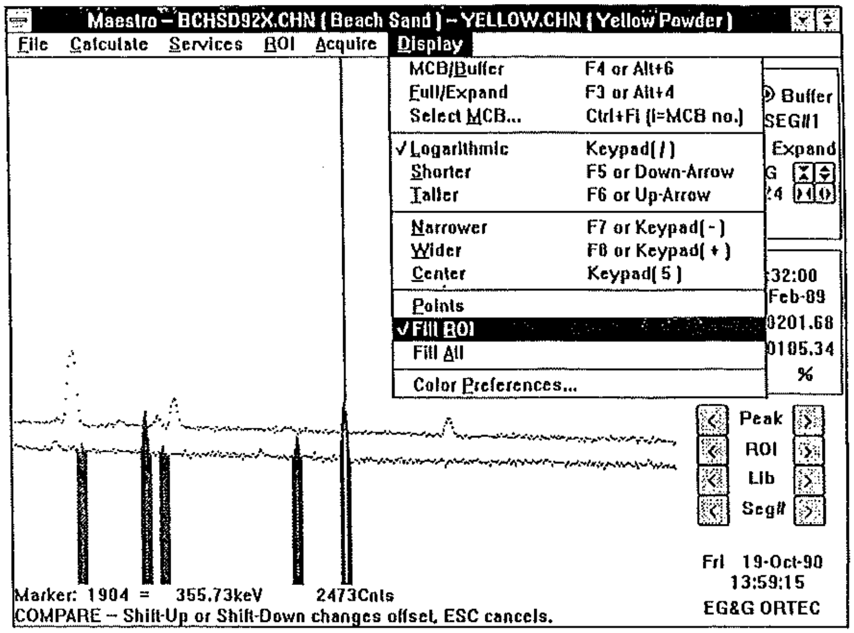
Note that the display update speed is dramatically affected by the display mode. Thus, "Point" or "Fill ROI" (unless a large number of ROIs are displayed) are the preferred modes for normal operation because of their faster update, while "Fill All" may be selected for picture-taking, because of its greater clarity of presentation.



Marker: 3232 = 599.30keV 96Cnts

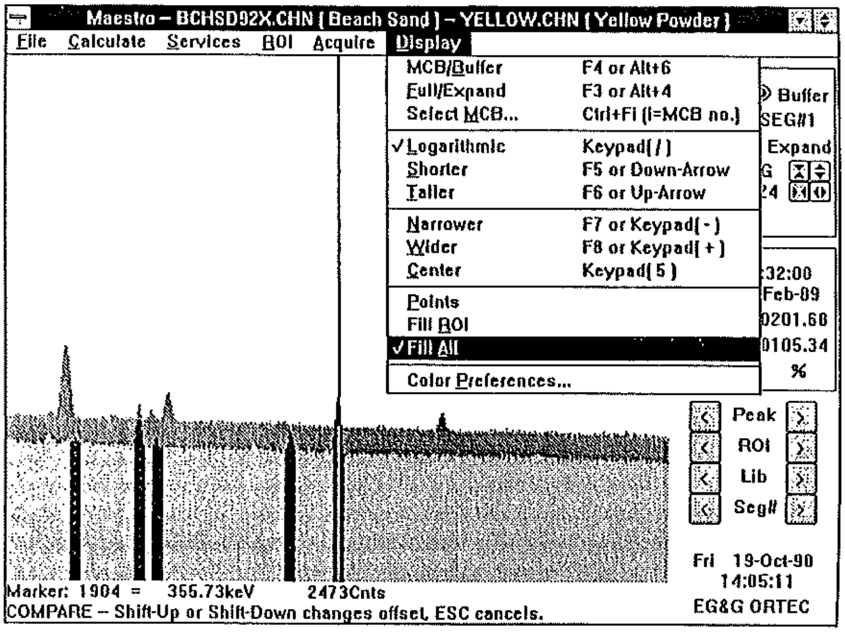
COMPARE – Shift-Up or Shift-Down changes offset, ESC cancels.

Fig. 16. Point Display.



Marker: 1904 = 355.73keV 2473Cnts
COMPARE – Shift-Up or Shift-Down changes offset. ESC cancels.

Fig. 17. Fill ROI Display.

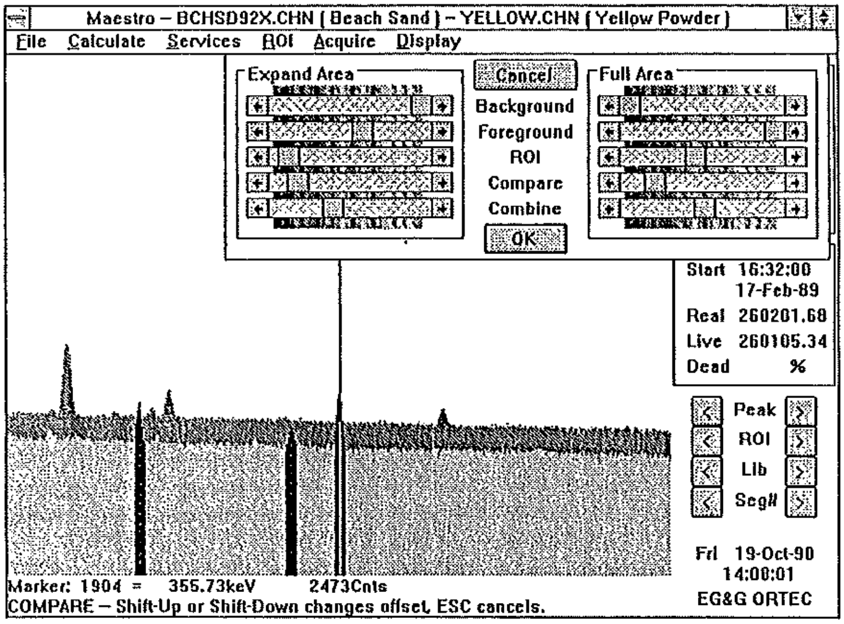


Marker: 1904 = 355.73keV 2473Cnts
COMPARE – Shift-Up or Shift-Down changes offset. ESC cancels.

Fig. 18. Fill All Display.

6.2.9. Color Preferences...

This dialog (see Fig. 19) is used to select colors for various features in the Spectrum window. Each scroll bar controls the color of a different feature. The vertical colored stripes behind the scroll bars are intended as a guide to the available colors. The color selections are shown immediately in the Spectrum window when they are changed in the dialog. If the OK button is pressed, these colors are retained and saved in the WIN.INI file for later recall when the application is restarted. If the dialog is CANCELled, the colors are reset to the values obtained previously from WIN.INI.

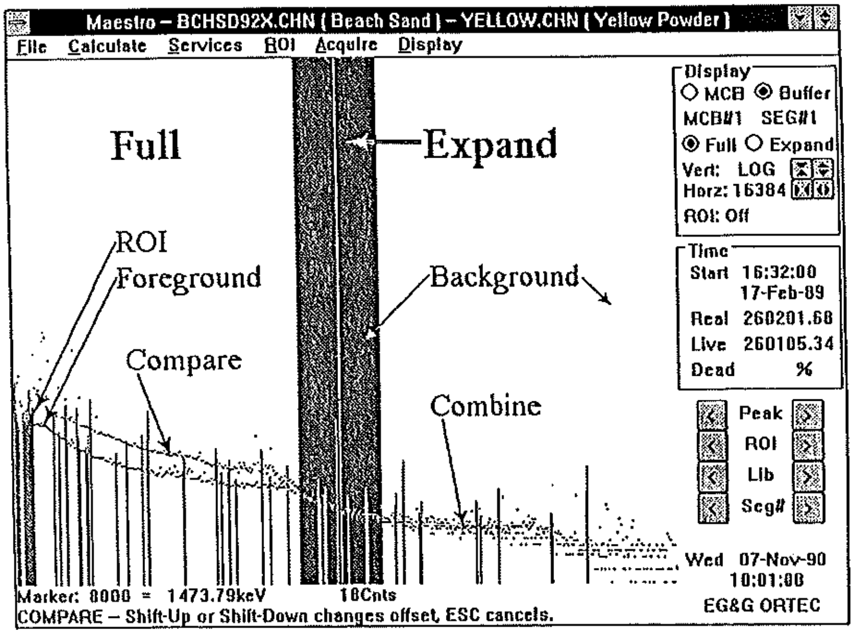


Marker: 1904 = 355.73keV 2473Cnts

COMPARE – Shift-Up or Shift-Down changes offset, ESC cancels.

Fig. 19. Color Preferences Dialog.

The nomenclature for Spectrum features used within this dialog should be fairly self-explanatory (see Fig. 20). The EXPANDED area of a spectrum uses the "EXPAND" colors, while any area outside of this area (in the FULL display) uses "FULL" colors. The FOREGROUND and BACKGROUND colors refer to the color of the spectral dots and the contrasting area behind the dots, respectively, whereas the ROI color is used to color dots representing channels within a marked ROI. The dots for the compared spectrum use the COMPARE color, unless they overlap with the original, in which case the COMBINE color is used.



Display
○ MCB ● Buffer
MCB#1 SEG#1
● Full ○ Expand
Vert: LOG
Horz: 16384
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Wed 07-Nov-90
10:01:08

Marker: 8000 = 1473.79keV 18Cnts
COMPARE – Shift-Up or Shift-Down changes offset, ESC cancels.

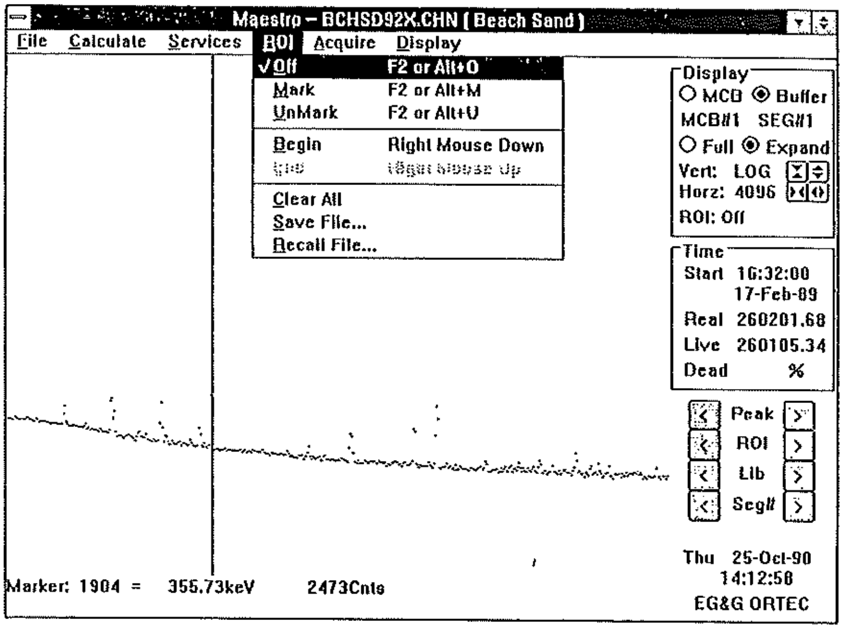
Fig. 20. Spectrum Color Areas.

Only the areas shown in Fig. 20 are affected by the DISPLAY/Color Preferences... dialog. The colors of other features of the display can be adjusted using the Windows control panel, which affects the appearance of all windows on the desktop.

6.3. ROI

A *Region Of Interest* (ROI) is a way to denote channels or groups of channels as having special meaning. A ROI can be used to mark peak areas for the printout or to mark a peak to stop acquisition when that peak reaches a preset value. Channels marked as ROI channels are displayed graphically with points of a different color than the unmarked channels.

The ROI menu is shown in Fig. 21. The ROI functions are available for both the Buffer and an MCB/Segment.



Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 4096
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Thu 25-Oct-90
14:12:58

Marker: 1904 = 355.73keV 2473Cnts

Fig. 21. ROI Menu.

The ROI status (Mark/UnMark/Begun/Off) is always shown in the Status window to the right of the Spectrum.

ROI Mark sets the ROI status to the Mark or set condition. In this state, the cursor channels are marked with the ROI bit as the cursor is moved with <→> or <←> into the channel. This function is also altered by <F2> or selected by <Alt+ M>.

The marking of ROIs can also be done with the Begin/End command (or mouse) and with <Ins>. Begin/End is useful for large regions and <Ins> is used for peak regions.

ROI Unmark sets the ROI status to the unmark or reset condition. In this state, the channels are unmarked with the ROI bit as the cursor is moved with <→> or <←> into the channel. This function is also altered by <F2> or <Alt+ U>.

ROI Off sets the ROI status to the Off condition. In this state, the ROI bit for the channels is unaltered by the cursor. This function is also altered by <F2> or <Alt+ O>.

The usual ROI status is Off so that the marker can be moved on the display without changing any of the ROI bits.

ROI Begin is used to set ROIs between two channels. It is used with the End command to set the ROI bit on all the channels between the two channels in the active MCB/Segment or the Buffer. To set the region, locate one end of the region to be set with the marker and use the ROI menu and the Begin item. This will record the channel number of the marker and set the ROI status to Begin. Now move the marker to the other end of the region and use the ROI menu and the End item. This will set the ROI bit on all the channels between and including the two ends. The ROI status is turned to Off.

ROI End sets the end channel when setting ROIs with Begin. It is used with Begin to set the ROI bits in the active MCB/Segment. If the ROI status is not Begun, this item is disabled and shown in gray.

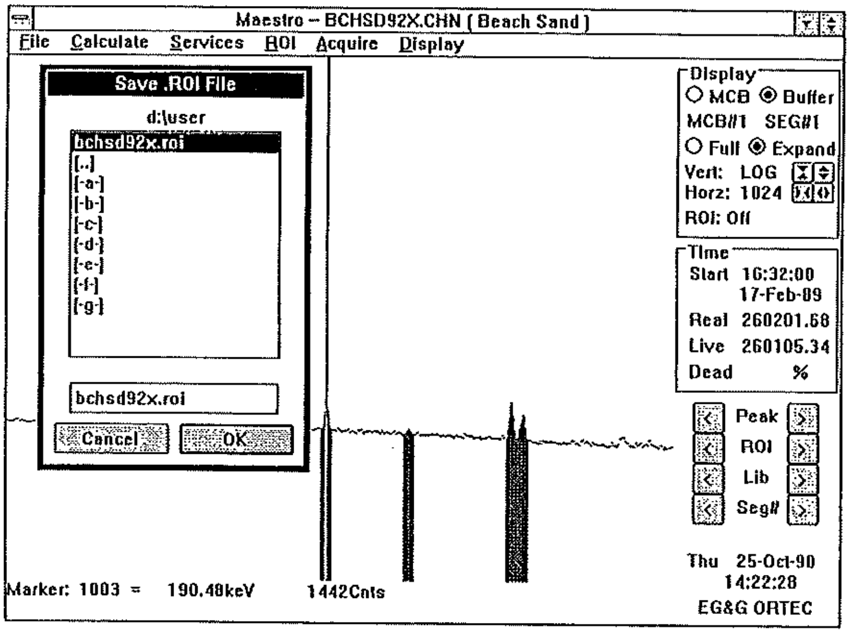
The Begin/End function is duplicated by the right mouse button. Depressing and holding down the right mouse button is equivalent to Begin; releasing it is equivalent to End.

ROI Clear All resets all the ROI bits in the active MCB/Segment or Buffer. This does not affect the ROI status.

6.3.1. Save File...

ROI Save File saves a table of the channel numbers that have the ROI set (in the Buffer, the active MCB/Segment, or all segments if the display is in FULL mode) to a disk file. The contents of the spectrum are not altered. Any number of files can be saved (with unique names, and up to the capacity of the disk, of course).

After selecting the Save item, the user must enter the filename as in Fig. 22. (Refer to Section 6.5.3 for tips in using this dialog.) An invalid or null filename aborts the Save operation. The file extension ".ROI" is recommended and is used by default.



d:\user

bchsd92x.roi
[..]
[-a-]
[-b-]
[-c-]
[-d-]
[-e-]
[-f-]
[-g-]

bchsd92x.roi

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 16:32:00 17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Marker: 1003 = 190.48keV 1442Cnts

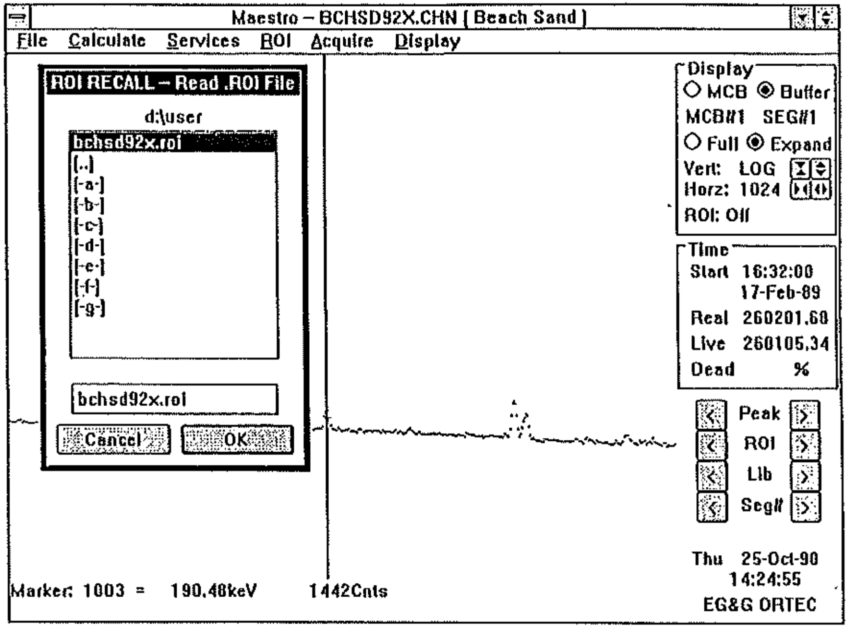
Thu 25-Oct-90 14:22:28

Fig. 22. Save ROI Data File.

If the file already exists, a warning message box appears, prompting the user to verify the filename before proceeding, and allowing him to cancel the operation. If the user OKs the operation, the file is over-written.

6.3.2. Recall File...

ROI Recall File brings up the dialog box shown in Fig. 23, prompting the user to select a filename. (Refer to section 6.5.3 for tips in using this dialog.) After a valid ROI file is selected, this command sets the ROIs in the Buffer or active MCB to conform to the table in the disk file created by ROI Save File (see above). The data contents of the MCB or Buffer are not altered by this operation, only the ROI bits. The previous ROIs in the Buffer or MCB are cleared.


Maestro – BCHSD92X.CHN [Beach Sand]
File Calculate Services ROI Acquire Display
ROI RECALL – Read .ROI File
Cancel
OK
Peak
ROI
Lib
Seg#

d:\user

bchsd92x.roi
[..]
[-a-]
[-b-]
[-c-]
[-d-]
[-e-]
[-f-]
[-g-]

bchsd92x.roi

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.60
Live 260105.34
Dead %

Marker: 1003 = 190.48keV 1442Cnts

Thu 25-Oct-90
14:24:55
EG&G ORTEC

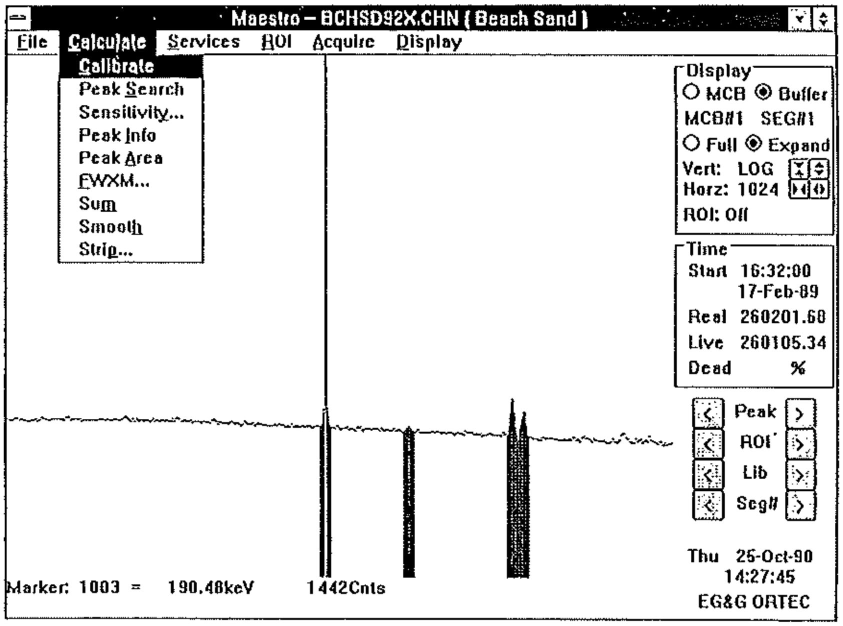
Fig. 23. ROI File Recall.

The ROIs are saved by channel number, so if the spectrum peaks have shifted in position the ROIs in the file will not correspond exactly to the spectrum data.

If the ROI file is saved for a FULL display that is segmented, a recall in EXPANDED mode sets only the ROIs set for the active segment.

6.4. Calculate

The Calculate menu is shown in Fig. 24. If the display is showing an MCB, the spectrum display is switched to the Buffer, since the Calculate functions are available only for the Buffer.



MCB#1 SEG#1
Vert: LOG
Horz: 1024
ROI: Off
Start 16:32:00 17-Feb-89
Real 260201.60
Live 260105.34
Dead %
Thu 25-Oct-90 14:27:45
Marker: 1003 = 190.48keV 1442Cnts

Fig. 24. Calculate Menu.

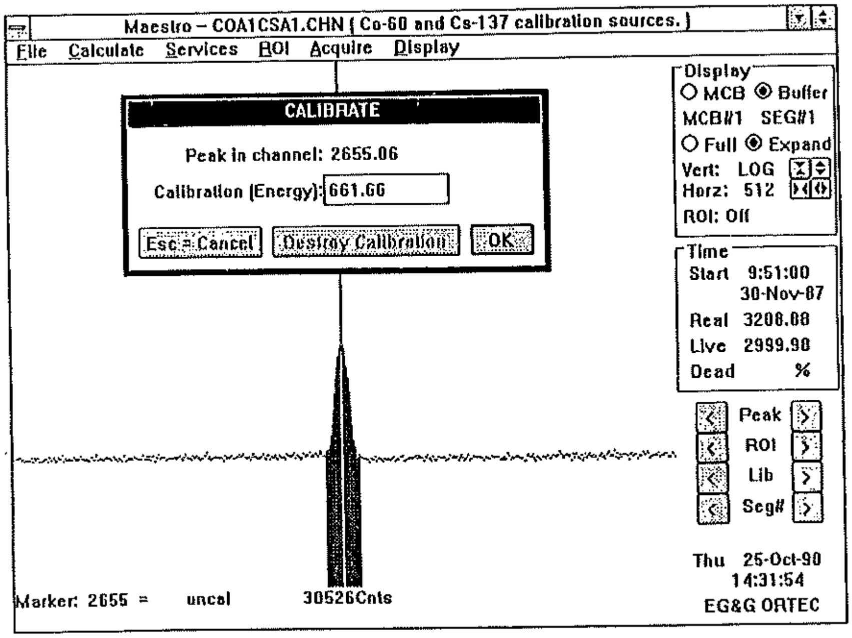
6.4.1. Calibrate...

The **Calibrate** function is used to establish a two-point linear calibration for the data memory such that channel position and peak parameters are reported in the specified units as well as channels. The default units are "keV" but can be any units as supplied by the user. The peak shape is measured and stored for later use in functions such as ROI Insert.

The calibration is stored with the spectrum when the Save function (see Section 6.5.1) is used. The calibration values are also saved when the program exits in the MCB.CFG default configuration file that is read when the program is started so that the calibration is automatically restored. Significantly altering the configuration destroys the calibration.

If the active MCB/Segment and segmentation (number of segments) are the same as the Buffer MCB/Segment and the Buffer segmentation, then the calibration for the Buffer is automatically transferred to the MCB. Otherwise, the calibrations of the MCBs and Buffer remain separate. Each MCB has separate calibration values and units.

The calibration is done by first marking two well-separated clean peaks with ROIs. The object is to supply the energies for these peaks. Place the marker on one of the peaks. Use <Ins> to insert an ROI on the peak. (This is not absolutely necessary, since if no ROI is present at the marker, the marker channel itself will be used.) Actuate CALIBRATE under the CALCULATE menu to select the marked peak and calculate the centroid of the peak. If there is an ROI at the marker and the marked peak is good (that is, if it can be used in the calculation), then the program asks for the energy (in keV) of the peak (see Fig. 25). If there is no ROI at the marker, then a warning appears at the bottom of the screen, and the marker channel is used instead of peak centroid.



Maestro – COA1CSA1.CHN (Co-60 and Cs-137 calibration sources.)

CALIBRATE

Peak in channel: 2655.06

Calibration (Energy): 661.66

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 512
ROI: Off

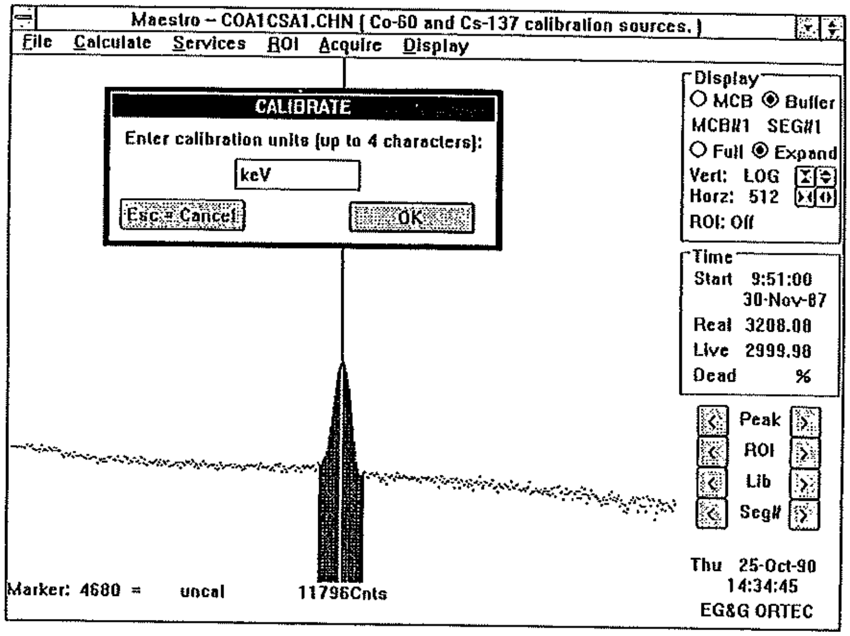
Time
Start 9:51:00 30-Nov-87
Real 3208.08
Live 2999.90
Dead %

Thu 25-Oct-90 14:31:54

Marker: 2655 = uncal 30526Cnts

Fig. 25. Calibration Value Input.

Now move the marker to the second peak and repeat the process. After the second peak value is entered, the program asks for four characters for the units (see Fig. 26). The system is now calibrated and the marker location is shown in both channels and the input units (Fig. 27).



Maestro – COA1CSA1.CHN (Co-60 and Cs-137 calibration sources.)

CALIBRATE

Enter calibration units (up to 4 characters): keV

Display: ○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 512
ROI: Off

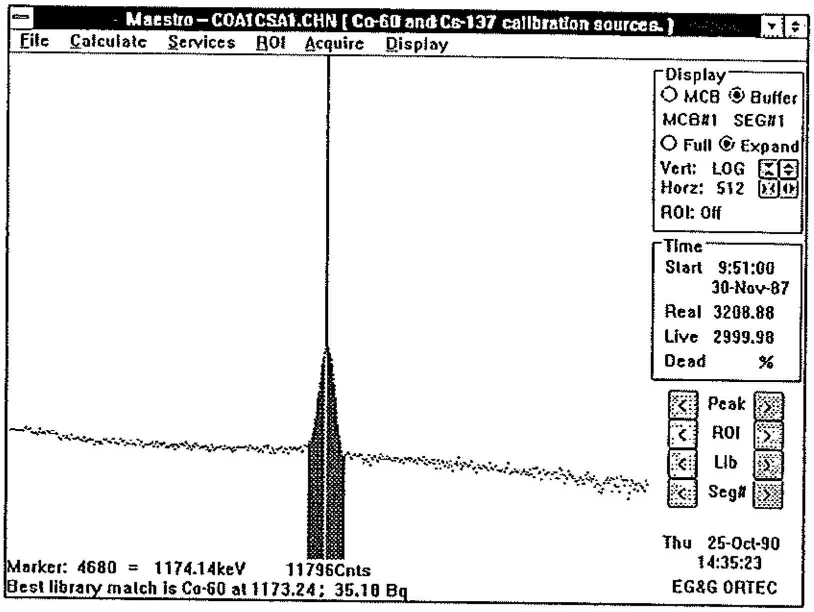
Time
Start 9:51:00 30-Nov-87
Real 3208.88
Live 2999.98
Dead %

Marker: 4680 = uncal 11796Cnts

Thu 25-Oct-90 14:34:45

EG&G ORTEC

Fig. 26. Calibration Units Input.



Maestro – COA1CSA1.CHN (Co-60 and Cs-137 calibration sources.)

Display: ○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 512
ROI: Off

Time
Start 9:51:00 30-Nov-87
Real 3208.88
Live 2999.98
Dead %

Marker: 4680 = 1174.14keV 11796Cnts
Best library match is Co-60 at 1173.24; 35.18 Bq

Thu 25-Oct-90 14:35:23

EG&G ORTEC

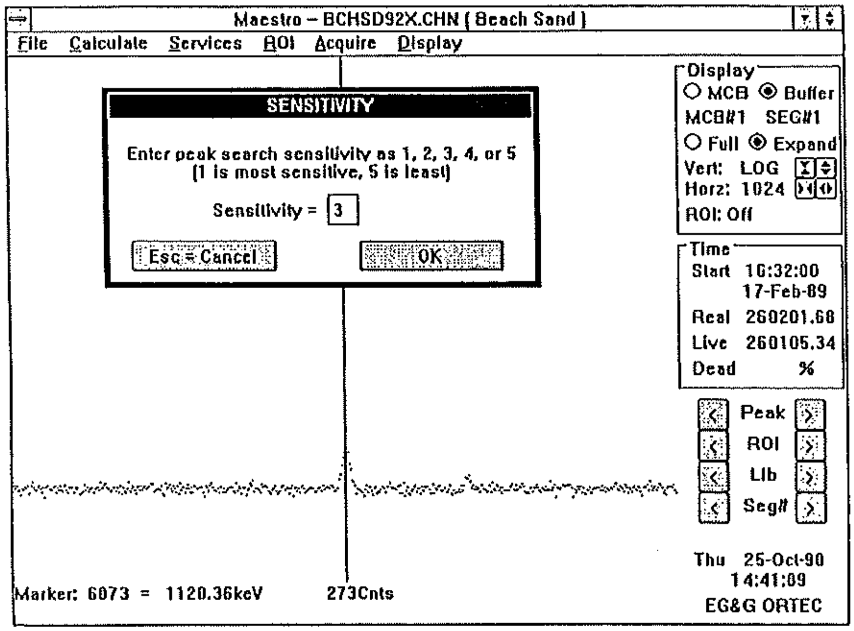
Fig. 27. Finished Calibration.

6.4.2. Sensitivity...

The Peak Search Sensitivity can be changed from 1 to 5, with 1 being the most sensitive; that is, 1 finds the most peaks.

The user can enter the integer value as shown in Fig. 28. The current value is shown on the screen. A value of 1 will find small peaks, but will also find many false peaks. A value of 5 will locate all the big peaks, but may miss some of the smaller peaks. The middle value of 3 is a good choice to start with.

The suspected peaks must pass a sensitivity test to be accepted. This test compares the magnitude of the second difference with the weighted error of the channel counts. The second difference must be greater than the weighted error to be accepted. The input sensitivity is a multiplicative factor in the weighting factor.


Maestro – BCHSD92X.CHN (Beach Sand)
File Calculate Services ROI Acquire Display
SENSITIVITY
Esc = Cancel
OK
Peak
ROI
Lib
Seg#
EG&G ORTEC

Enter peak search sensitivity as 1, 2, 3, 4, or 5
(1 is most sensitive, 5 is least)

Sensitivity = 3

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Thu 25-Oct-90
14:41:09

Marker: 6073 = 1120.36keV 273Cnts

Fig. 28. Peak Search Sensitivity Dialog.

6.4.3. Peak Search

This function initiates a Mariscotti[1]-type peak search on the spectrum in the Buffer. Only the active Segment is searched. The Peak Search sensitivity is selected in the Sensitivity item of this menu. Each peak found is marked with an ROI. If the system is calibrated, the width of the ROI is three times the calculated FWHM of the peak. If not calibrated, the width of the ROI is based on the width of the peak as determined by the peak search. Overlapping or close peaks may have contiguous ROIs. Existing ROIs are not cleared.

The Report function (see Section 6.5.5) can be used with this function to produce a semi-quantitative nuclide list for the spectrum.

6.4.4. Peak Info

This command displays one of the following for the marker in an ROI:

1. If the spectrum is not calibrated, the channel centroid, FWHM, FW.1M, and FW.02M (in channels) are displayed for the ROI peak marked by the marker.
2. If calibrated, channel centroid and the FWHM, in channels and calibration units (e.g., energy), and the library "best match" are displayed for the ROI peak marked by the marker.

This information is displayed beneath the Spectrum window underneath the Marker caption.

The program calculates the background using the average of the last three channels of the ROI on each side of the peak as end points of the straight-line fit. The background is calculated from the midpoint of the three points used in the average.

The program subtracts the calculated background, channel by channel, and attempts a least-square fit of a Gaussian function to the remaining data. If unsuccessful, it displays "**Could Not Properly Fit Peak**". If successful, the centroid is based on the fitted function. The reported widths are linearly interpolated between the background-subtracted channels.

---

[1] M.A. Mariscotti, "A Method for Automatic Identification of Peaks in the Presence Background and its Application to Spectrum Analysis," *Nuclear Instruments and ethods* 50, 309-320 (1967).

6.4.5. Peak Area

This function displays the net area, gross area, activity, and the error of the net area for the ROI peak that is marked.

The background on the low channel side of the peak is the average of the first three channels of the ROI (see Fig. 29). The channel number for this background point is the middle channel of the three points. The background on the high channel side of the peak is the average of the last three channels of the ROI. The channel number for this background point is also the middle channel of the three points. These two points on each side of the peak form the end points of the straight-line background.

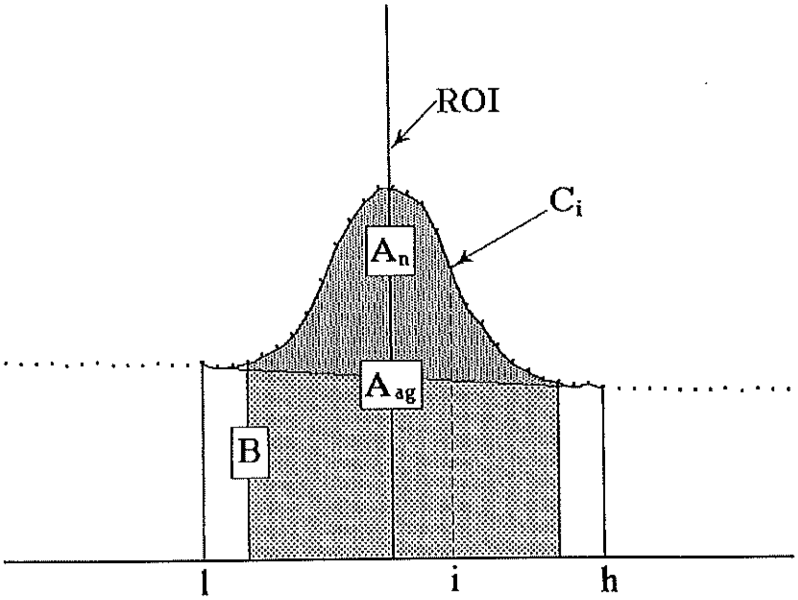


Fig. 29. Background Calculation.

The background is given by the following:

$$B = \left(\sum_{i=l}^{l+2} C_i + \sum_{i=h-2}^{h} C_i \right) \frac{h - l + 1}{6}$$

where

B = the background area

l = the ROI low limit

h = the ROI high limit

C_i = the contents of channel i

6 = the number of data channels used (3 on each end)

The gross area is the sum of all the channels marked by the ROI according to the following:

$$A_g = \sum_{i=l}^{h} C_i$$

where

A_g = the gross counts in the ROI

l = the ROI low limit

h = the ROI high limit

C_i = the contents of channel i

The adjusted gross area is the sum of all the channels marked by the ROI but not used in the background according to the following:

$$A_{ag} = \sum_{i=l+3}^{h-3} C_i$$

where

A_{ag} = the adjusted gross counts in the ROI

l = the ROI low limit

h = the ROI high limit

C_i = the contents of channel i

The net area is the adjusted gross area minus the adjusted calculated background, as follows:

$$A_n = A_{ag} - \frac{B\ (h-l-5)}{(h-l+1)}$$

The error in the net area is the square root of the sum of the squares of the errors in the adjusted gross area and the weighted error of the adjusted background. The background error is weighted by the ratio of the adjusted peak width to the number of channels used to calculate the adjusted background. Therefore, net peak area error is given by:

$$\sigma_{An} = \sqrt{A_{ag} + B\left(\frac{h-l-5}{6}\right)\left(\frac{h-l-5}{h-l+1}\right)}$$

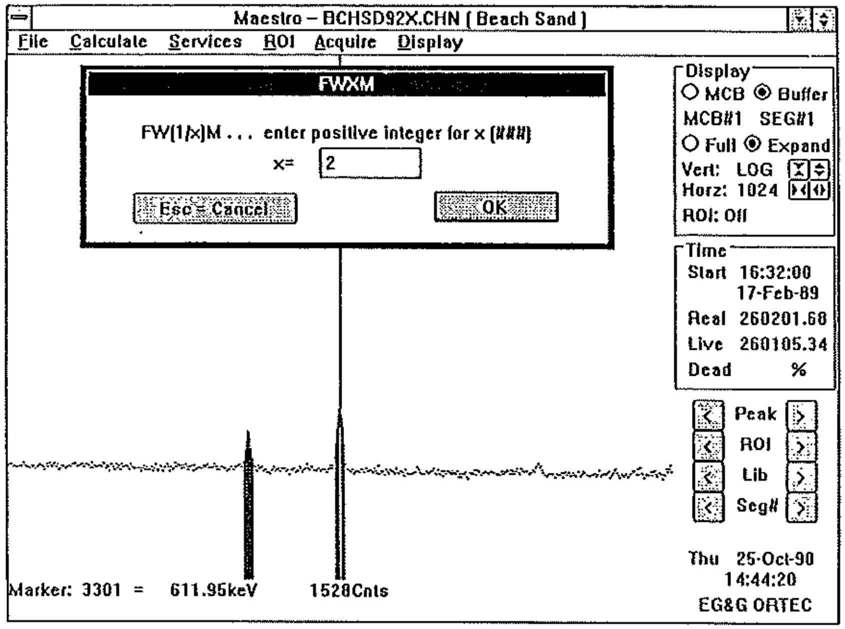
where

A_g = the gross area
A_n = the net area
B = the background area
C_i = the contents of channel i
l = the ROI low limit
h = the ROI high limit

6.4.6. FWXM...

The **FWXM** function ultimately displays the full-width-at-1/X-maximum for the ROI peak marked by the cursor. The background is subtracted before the calculation (see Section 6.4.4). The dialog (Fig. 30) prompts the user to enter the X factor, which is an integer from 1 to 999.

After the computation is completed, the result is shown below the spectrum in the information line. The result is always given in channels, and, if calibrated, in the units entered in the calibration input.



FW(1/x)M . . . enter positive integer for x (###)

x= 2

MCB#1 SEG#1

Vert: LOG

Horz: 1024

ROI: Off

Start 16:32:00 17-Feb-89

Real 260201.68

Live 260105.34

Dead %

Thu 25-Oct-90 14:44:20

Marker: 3301 = 611.95keV 1528Cnts

Fig. 30. FWXM.

6.4.7. Sum

The **Sum** function performs its calculation in one of two ways, depending on the position of the marker:

1. If the marker is not in an ROI, then the sum of the data channels of the Buffer segment is shown on the display. The complete channel width (e.g., 1 to 4096) is summed.

2. If the marker is in an ROI then the sum of the data channels in the ROI is shown on the display. This is the same as the gross counts in the Peak Area display, but can be used on wider ROIs.

6.4.8. Smooth

The **Smooth** function transforms the data in the active Buffer segment according to a five-point, area preserving, binomial smoothing algorithm; that is, the existing data is replaced, channel-by-channel, with the averaged or smoothed data as follows:

$$S_i = (O_{i-2} + 4O_{i-1} + 6O_i + 4O_{i+1} + O_{i+2}) / 16$$

where

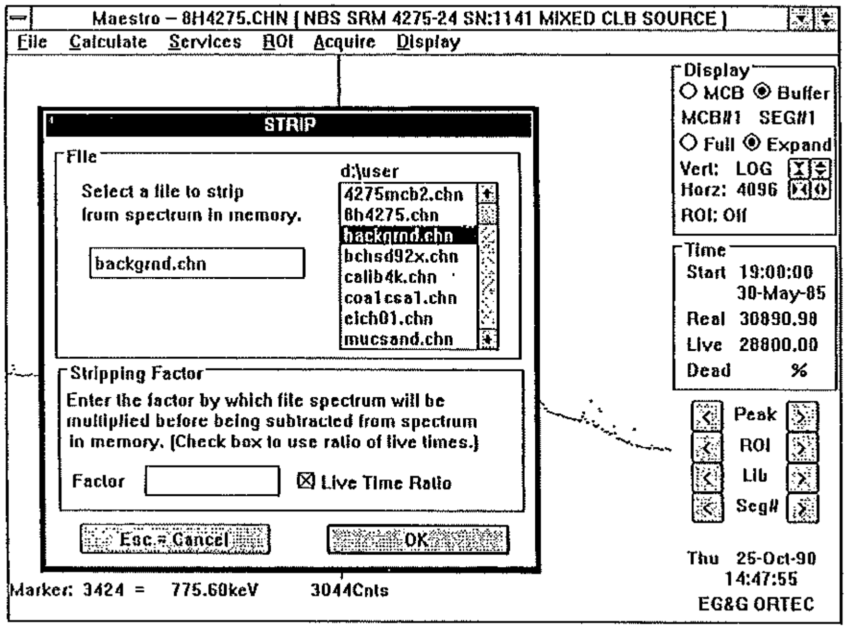
S_i = the smoothed data in channel i
O_i = the original data in channel i

6.4.9. Strip...

When Strip... is selected, the dialog box shown in Fig. 31 appears, prompting the user for a filename and stripping factor. When OK'd, this function strips the specified disk spectrum from the spectrum in the Buffer and stores the result in the Buffer.

The file selected should be a valid .CHN format spectral data file containing the same number of channels as the Buffer.

The strip factor is a real number that is multiplied channel-by-channel times the disk spectrum before being subtracted from the Buffer. If the "Live time Ratio" box is checked, the strip factor is calculated as the ratio of the live time of the Buffer spectrum divided by the live time of the disk spectrum. The factor can be negative, in which case the spectra are added.


Maestro – 8H4275.CHN (NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE)

STRIP

File

Select a file to strip from spectrum in memory.

backgrnd.chn

d:\user

4275mcb2.chn
8h4275.chn
backgrnd.chn
bchsd92x.chn
calib4k.chn
coalcsa1.chn
eich01.chn
mucsand.chn

Stripping Factor

Enter the factor by which file spectrum will be multiplied before being subtracted from spectrum in memory. (Check box to use ratio of live times.)

Factor

☒ Live Time Ratio

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 4096
ROI: Off

Time
Start 19:00:00
30-May-85
Real 30890.98
Live 28800.00
Dead %

Marker: 3424 = 775.60keV 3044Cnts

Thu 25-Oct-90
14:47:55
EG&G ORTEC

Fig. 31. Spectrum Strip.

The live times and real times are not altered by any strip operation. The peak errors (see Section 6.4.5) will not include the stripped areas and may not represent the true error.

6.5. File

The File menu is shown below. If the display is showing an MCB, the spectrum display is switched to the Buffer, since the File functions are only available for the Buffer.

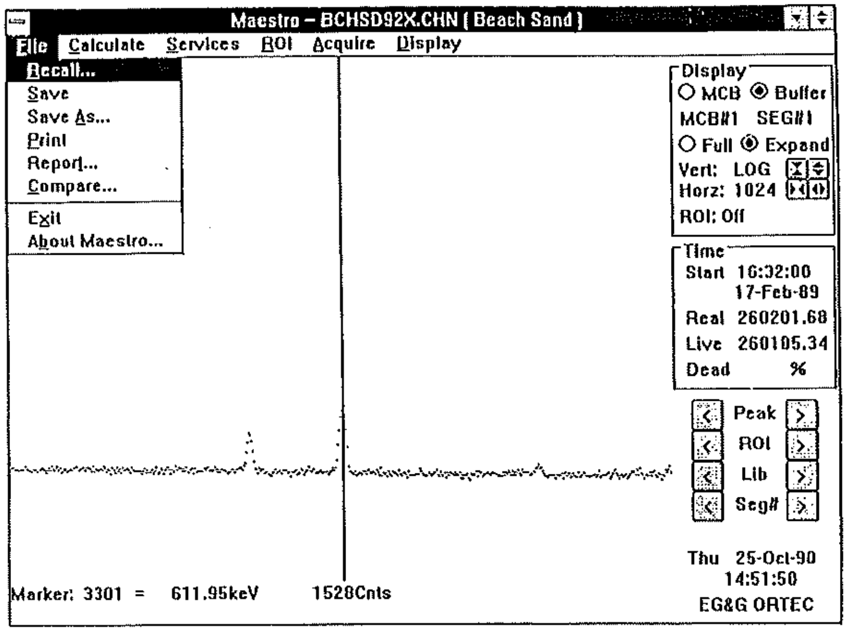
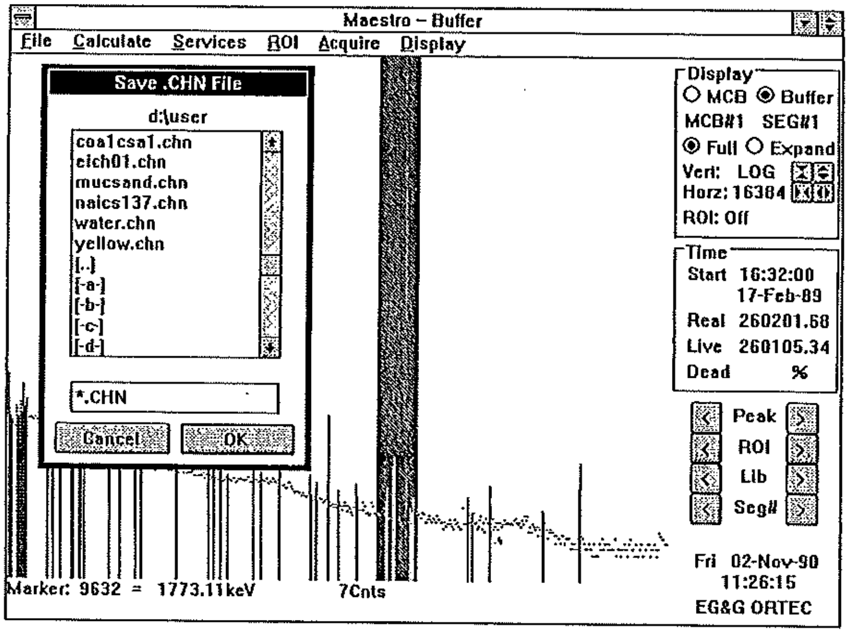


Fig. 32. File Menu.

6.5.1. Save / Save As...

These functions write the spectrum (or active Segment) from the Buffer to disk. Whenever **Save As...** is selected, or when **Save** is selected with a Buffer that has no previous filename associated with it, the dialog box shown in Fig. 33 appears, prompting the user for a filename. (Refer to Section 6.5.3 for tips on using this dialog.) **Save** with a Buffer that already has an associated filename does not require this dialog, although the **Save As...** function will require it every time. Any valid DOS path name can be used (consisting of an optional drive and directory, a filename, and an optional extension). The recommended and default extension is ".CHN", since the .CHN format is used to save the spectrum.



d:\user

coalcsal.chn
eich01.chn
mucsand.chn
naics137.chn
water.chn
yellow.chn
[..]
[-a-]
[-b-]
[-c-]
[-d-]

*.CHN

○ MCB ● Buffer
MCB#1 SEG#1
● Full ○ Expand
Vert: LOG
Horz: 16384
ROI: Off

Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Marker: 9632 = 1773.11keV 7Cnts

Fri 02-Nov-90
11:26:15
EG&G ORTEC

Fig. 33. Save Spectrum on Disk.

If the file already exists after the path has been OK'd in the above dialog, a message box appears prompting the user to verify his entry or CANCEL the operation. If he OK's the operation, the existing file will be overwritten.

According to the .CHN file format, the following are stored with the data: live time, real time, acquisition start time, detector and sample descriptions, and calibration (if any.) The .CHN file structure is detailed in Appendix A, and is compatible with a wide variety of analysis programs. (The .SPC format is not described in this document and cannot be written by MAESTRO, although it can be read by the "Recall..." function.)

In a segmented system, the Save/Save As... function must be exercised once for each segment, since the .CHN format is designed to convey information for only one segment at a time.

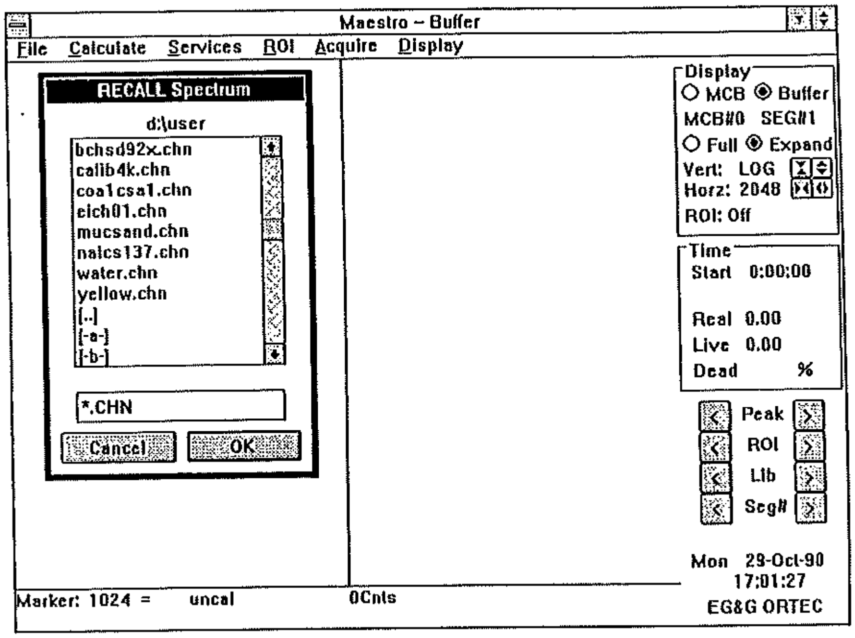
After the disk file has been written, the entered filename is displayed in the Title Bar.

6.5.2. Recall...

This function reads a spectral data file created by MAESTRO Save/Save As... functions or by other programs (e.g., MAESTRO II, or any program producing the .CHN format; also, the .SPC format can be read). The file is read into the Buffer area. At that time the Buffer is resized to conform to the memory size and segmentation of the recalled spectrum. The program restores the file to the proper segment.

When the **Recall...** function is selected, a list of spectra on the disk will be displayed on the screen in a dialog box as shown in Fig. 34. This is the standard file recall dialog used in several places, and described in Section 6.5.3.

When the spectrum has been read successfully by this function, the descriptors (start time, live time, real time, detector and sample descriptions, etc.) are obtained from the file for the Buffer. If the spectrum file has calibration information, then this is used to set the calibration for the Buffer. Also, the filename is displayed in the Title Bar.



d:\user

bchsd92x.chn
calib4k.chn
coa1csa1.chn
eich01.chn
mucsand.chn
naics137.chn
water.chn
yellow.chn
[..]
[-a-]
[-b-]

*.CHN

○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Start 0:00:00
Real 0.00
Live 0.00
Dead %

Mon 29-Oct-90
17:01:27
EG&G ORTEC

Marker: 1024 = uncal
0Cnts

Fig. 34. Spectrum File Recall.

6.5.3. Using File Dialogs

For all functions in MAESTRO which involve reading files from or writing files to disk, a consistent user interface is provided. A dialog is presented which includes, at a minimum, a list box, an edit box, and some associated text (for example, refer to **Recall...** in Fig. 34 as a typical dialog). The usage should be fairly self-explanatory, but since a lot of power and flexibility may not be so obvious, here are a few more tips.

The list box contains a list of files that actually exist in the current directory, selected according to a default extension which depends upon the function being exercised. For example, during FILE RECALL, all the files will have the extension .CHN by default. In addition to these files, however, the list box contains all valid drives (A: through D:, for example) and all directories relative to the current working directory (including the parent directory denoted by [..]). Further, the full path name of the current working drive/directory is displayed in text above the list box, for reference.

The currently selected filename is displayed in the edit box, and also highlighted in the list box (if possible). A file is selected using the usual keyboard and/or mouse controls from the list box. (Pressing <Enter> or double-clicking on the entry completes the selection.) Alternatively, the full pathname of any file can be entered directly into the edit box.

Changing Path: Note that if the desired file path is not currently displayed, the drive and/or directory may be changed by selecting either one of the drive or subdirectory elements (including [..]) listed in the list box. Click on the desired drive or directory with the mouse pointer.

Changing File Type/Extension: Note also that if a different default extension is desired, a filename containing wildcards (e.g., *.ext, where "ext" is the desired extension), can be entered in the edit box. In this case, <Enter> will then cause the list box to be updated to reflect this new class of files, rather than completing the selection.

6.5.4. Print

The **Print** function does one of the following:

1. If the display is in FULL mode, contents of all channels are printed.
2. If the display is in EXPAND mode and the marker is in an ROI, the data contents of the ROI channels are printed.
3. If the display is in EXPAND mode and the marker is not in an ROI, the contents of channels in the active segment are printed.

The printout is automatically sent to the printer via the Windows print spooler. An abort box appears while the function is being performed, allowing the user to cancel the operation.

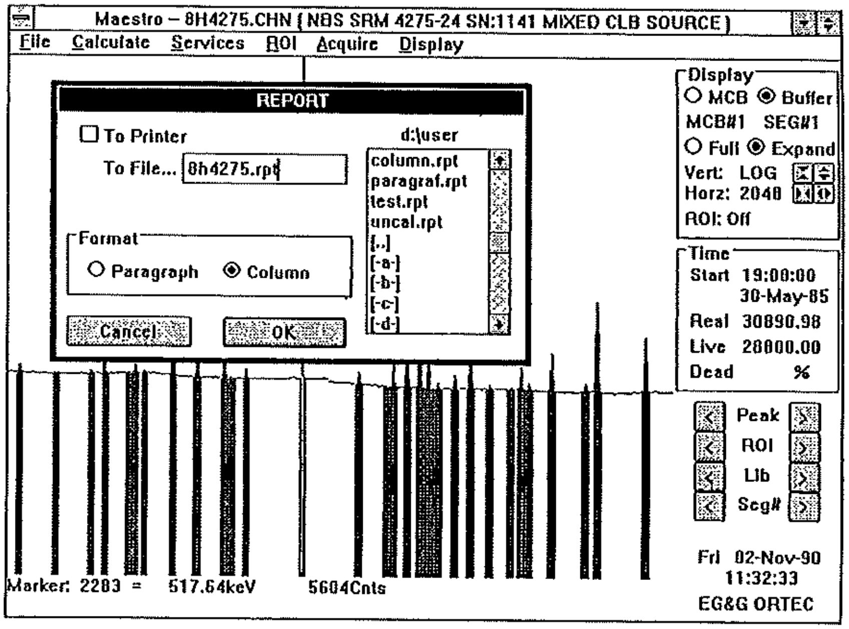
The data are formatted as 10 channels per line with the channel number on the left, thus requiring a 132-column printer.

6.5.5. Report...

The **Report...** function creates a report describing acquisition conditions and contents of all ROIs, and sends this to a disk file or to the printer. The dialog shown in Fig. 35 first prompts the user for a filename, and provides the option of sending the report to the printer (via the Windows print spooler). The user may also select from two report formats.

Examples of both report formats follow. For both Report formats, the same information is supplied. If the spectrum is not calibrated, the following are reported for each ROI:

1. ROI number and segment number (1 is lowest in the segment)
2. Start channel of the ROI
3. Stop channel of the ROI
4. Gross area of the peak
5. Net area of the peak, as calculated in Calculate, Peak Area
6. Error in net area, as calculated in Calculate, Peak Area
7. Centroid channel of peak, as calculated in Calculate, Peak Area
8. FWHM
9. FW.1M



☐ To Printer
To File... 8h4275.rpt
d:\user
column.rpt
paragraf.rpt
test.rpt
uncal.rpt
[..]
[-a-]
[-b-]
[-c-]
[-d-]
Format
○ Paragraph ● Column

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Time
Start 19:00:00 30-May-85
Real 30890.98
Live 28000.00
Dead %

Marker: 2283 = 517.64keV 5604Cnts

Fri 02-Nov-90
11:32:33

Fig. 35. Spectrum Report Dialog.

If the spectrum is calibrated, both calibrated and channel values are given for 1.-9. above, and in addition the following is also included:

10. The best match from the library

And, if a match is found in the library:

11. The activity, calculated using the net area, the live time, and the factor from the library.

The activity calibration factor in the library is discussed in Section 8.1. In addition, the ULI program (B30-BI, V3.4 and up) can create the library with factors from the output of the CLB program (B30-BI).

```
MCB # 1     . ACQ 30-May-85 at 19:08:00    RT = 30891.0    LT = 28800.0
                P-40WA 28% 1.85KEV @1332.5 2500V BIAS
                NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE

ROI # 1-1       RANGE: 7 = 3.07keV  to   28 = 7.82keV
                AREA : Gross =   1524091    Net = 657581     +/-1722
                CENTROID: 16.44   = 5.20keV
                SHAPE: Fwhm = 1.79        Fwtm = 3.07
                No close library match.

ROI # 1-2       RANGE: 145 = 34.27keV  to  161 = 37.88keV
                AREA : Gross =   391474    Net = 2938     +/-845
                CENTROID: 153.50   = 36.19keV
                SHAPE: Fwhm = 0.67      Fwtm = 1.26
                ID: Cs-137 at 36.40keV
                Corrected Rate = 7.79 +/- 2.24

ROI # 1-3       RANGE: 178 = 41.73keV  to   227 = 52.81keV
                AREA : Gross =   1282525    Net = 374398      +/-2652
                CENTROID: 185.39   = 43.40keV
                SHAPE: Fwhm = 1.19      Fwtm = 2.01
```

Fig. 36. Example Spectrum Report (Paragraph Format).

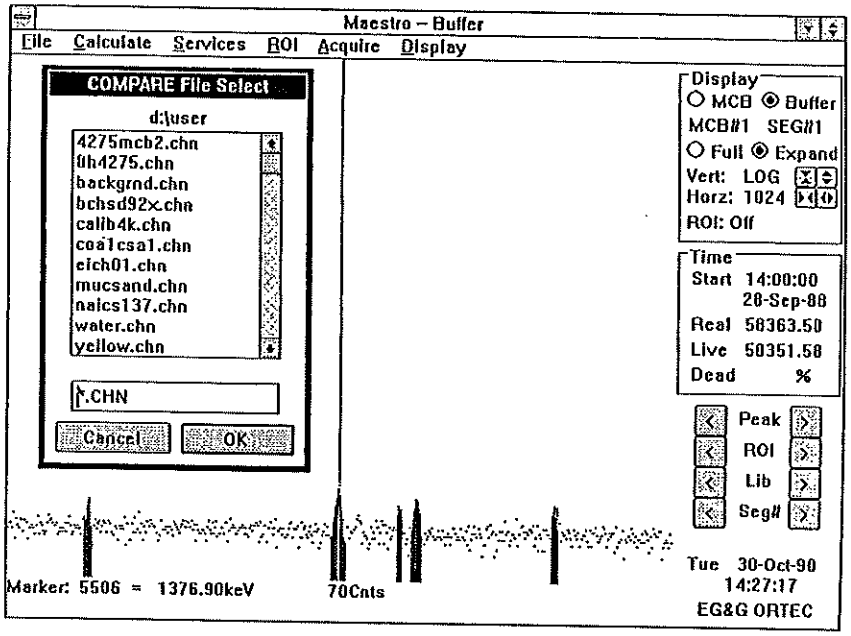
```
MCB # 1      ACQ 30-May-85 at 19:08:00    RT = 30891.0    LT = 28800.0
SEG # 1      P-40WA 28% 1.85KEV @1332.5 2500V BIAS
             NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE
ROI#   RANGE( keV)      GROSS       NET   +/-   CENTROID FWHM FW.1M LIBRARY ( keV)       Bq +/-
  1    3.07    7.82   1524091    657581  1722       5.20 1.79  3.07  No close library match.
  2   34.27   37.88    391474      2938   845      36.19 0.67  1.26 Cs-137     36.40   7.79 2.
  3   41.73   52.81   1282525    374398  2652      43.40 1.19  2.01 Eu-154     42.80  45.66 0.
  4   58.46   62.53    283921     26331   764      60.50 0.88  1.64 Eu-155     60.01  80.20 2.
  5   71.12   77.45    460625      8527  1319      75.37 0.84  2.29 W-187      72.00   2.75 0.
  6   84.91   88.98   1934014   1547786  1544      86.85 0.94  1.76 Tb-160     86.79 407.14 0.
  7  103.45  111.59   2019120   1236314  2298     105.49 0.95  1.76 Eu-155    105.31 209.40 0.
  8  114.98  119.05    393151     15035   913     117.02 0.94  1.87 Lu-177    112.95   8.16 0.
  9  121.08  125.15   7371974   7074359  2778     123.14 0.97  1.78 Eu-154    123.14 606.50 0.
 10  129.45  133.52    185598      3774   630     131.60 0.93  1.75 Hf-181    133.02   0.32 0.
 11  143.92  147.99    171608      3684   606     145.95 0.92  1.83 Ce-141    145.44   0.26 0.
 12  170.37  178.06    747655    411326  1427     176.06 1.02  1.89 Sb-125    176.33 210.34 0.
 13  185.97  190.04    217587     33843   657     187.95 1.04  1.93 Ra-226    186.21  35.83 0.
 14  201.80  209.71    395081     29648  1362     203.81 1.10  1.93 U-235     205.31  20.47 0.
 15  225.53  233.90    360968      8939  1373     227.49 1.14  2.13 Te-132    228.16   0.35 0.
 16  245.20  249.73   1018460    839626  1134     247.52 1.10  2.03 Eu-154    248.04 442.39 0.
 17  302.40  306.92    134892      2715   577     304.55 0.95  2.45 Ba-140    304.84   2.19 0.
 18  318.45  322.98    148782     20092   584     320.84 1.66  2.80 Cr-51     320.08   7.10 0.
 19  343.78  348.30    126694      1672   560     346.26 0.31  1.49 Hf-181    345.95   0.48 0.
 20  368.19  372.72    131915      6374   565     370.57 1.25  2.06 Ba-131    373.25   1.66 0.
 21  377.69  382.21    173102     46664   602     380.02 1.24  2.19 Sb-125    380.43 106.60 1.
 22  394.42  403.01    255157     12353  1160     400.81 1.20  1.97 Se-75     400.66   3.71 0.
 23  405.27  409.79    134185      5798   571     407.65 1.26  2.41 Xe-135    407.99  56.23 5.
 24  424.94  429.91    954135    823545  1092     427.46 1.26  2.31 Sb-125    427.89  97.13 0.
```

Fig. 37. Example Spectrum Report (Column Format).

6.5.6. Compare...

The Compare mode allows a disk spectrum to be displayed with the current spectrum so that the two may be visually compared. The two spectra are in different colors.

When the **Compare...** function is selected, a file dialog appears, as shown in Fig. 38. After a valid spectrum file is selected, a second trace appears in the Spectrum window corresponding to the contents of that file, as shown in Fig. 39.



d:\user

4275mcb2.chn
0h4275.chn
backgrnd.chn
bchsd92x.chn
calib4k.chn
coalcsa1.chn
eich01.chn
mucsand.chn
naics137.chn
water.chn
yellow.chn

*.CHN

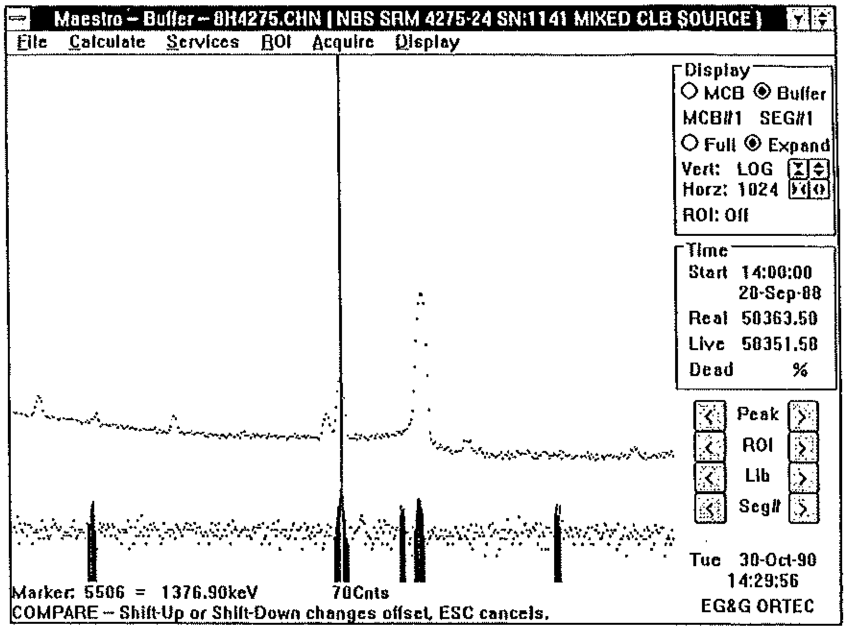
Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 14:00:00
28-Sep-88
Real 58363.50
Live 58351.58
Dead %

Marker: 5506 = 1376.90keV
70Cnts

Tue 30-Oct-90
14:27:17
EG&G ORTEC

Fig. 38. Compare... Dialog.



Maestro – Buffer – 8H4275.CHN [NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE]

MCB#1 SEG#1
Vert: LOG
Horz: 1024
ROI: Off

Start 14:00:00
20-Sep-88
Real 50363.50
Live 50351.50
Dead %

Tue 30-Oct-90
14:29:56

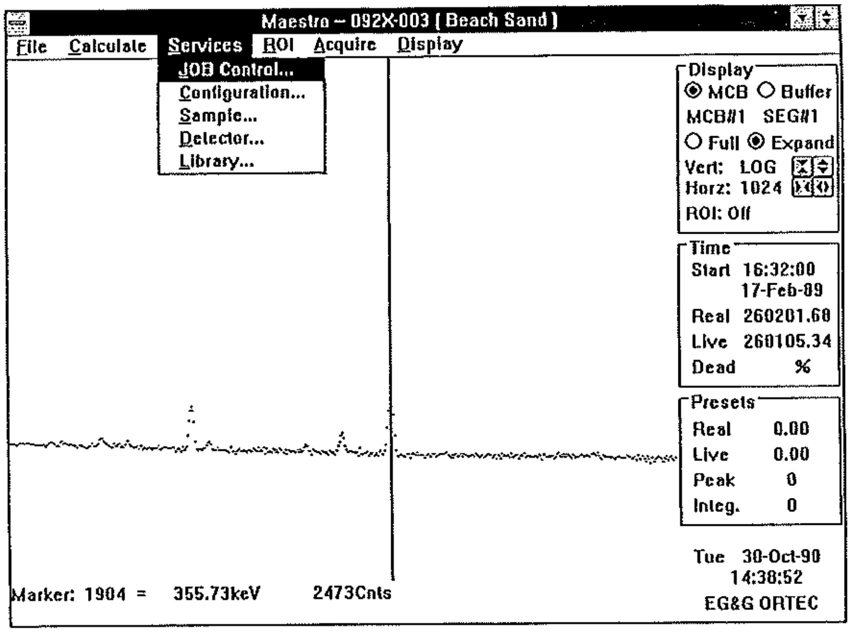
Marker: 5506 = 1376.90keV 70Cnts
COMPARE – Shift-Up or Shift-Down changes offset, ESC cancels.

Fig. 39. COMPARE Mode.

While in Compare mode, the disk spectrum can be moved vertically with <Shift+ ↑> and <Shift+ ↓>. To cancel COMPARE mode, use <Esc>. The keypad functions and radio buttons may also be used while in COMPARE mode.

6.6. Services

The Services menu is shown below.



Display
● MCB ○ Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.60
Live 260105.34
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Tue 30-Oct-90
14:38:52
EG&G ORTEC

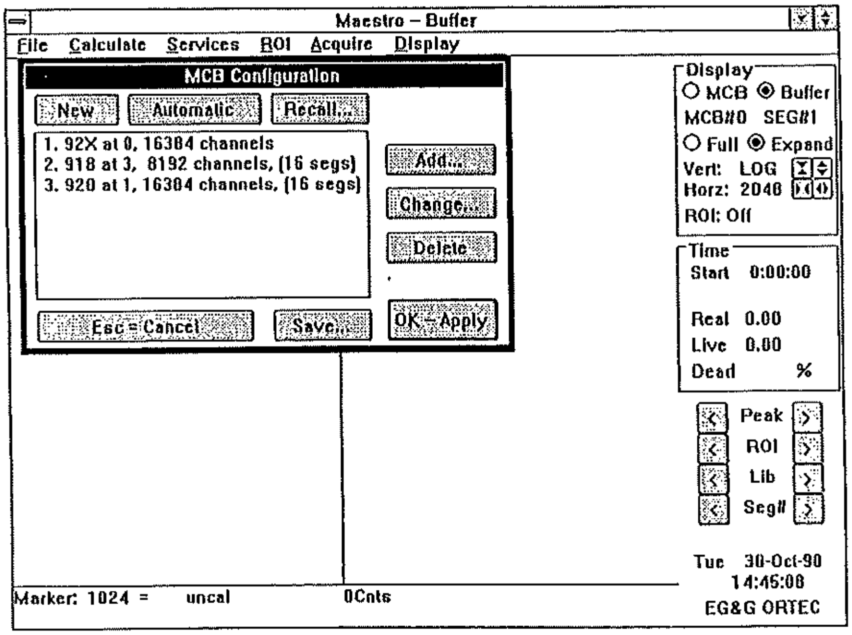
Marker: 1904 = 355.73keV 2473Cnts

Fig. 40. Services Menu.

6.6.1. Configuration...

The **Configuration** function is used to alter the current MCB configuration. (Refer to Section 3 for a definition of "configuration.") The dialog shown (Fig. 41) allows the user to add, change, or delete MCBs from the current configuration manually, to perform an automatic configuration, and/or to save and restore configurations to and from disk files.

A "scratchpad" configuration appears in the list box of this dialog, and is copied from the currently active working configuration when the function is first selected. Note that configurations established by this dialog (Fig. 41) do not take effect as the current configuration until the **OK -- Apply** push button is actuated, in which case the previous working configuration is destroyed. Conversely, the configuration previously in effect remains in effect if the **Cancel** function is performed, in which case the scratchpad configuration created within the dialog is lost.



1. 92X at 0, 16384 channels
2. 918 at 3, 8192 channels, (16 segs)
3. 920 at 1, 16384 channels, (16 segs)

Display
○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Time
Start 0:00:00
Real 0.00
Live 0.00
Dead %

Tue 30-Oct-90
14:45:08
EG&G ORTEC

Marker: 1024 = uncal 0Cnts

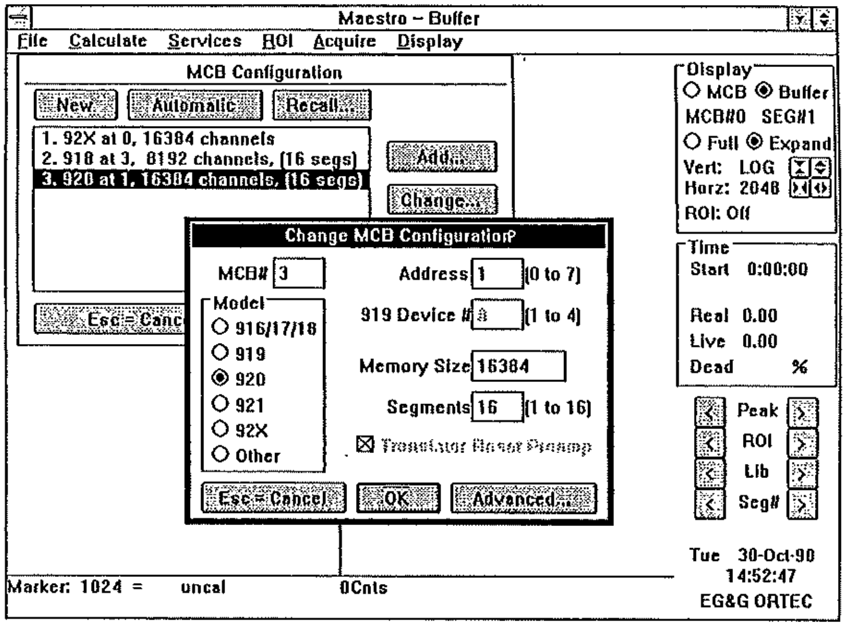
Fig. 41. Configuration Dialog.

Automatic configuration establishes a configuration based upon the hardware physically connected to the system. It does this by scanning all possible addresses and identifying all MCB/devices which exist at each address.

New just erases the scratchpad configuration so that no MCBs are shown.

Recall... and **Save...** are complementary functions for reading and writing configurations from and to disk files. The usual file selection dialogs are used. The default file extension used is .CFG.

Add..., Change..., and **Delete** are functions associated directly with the scratchpad configuration shown in the list box for adding, changing, or deleting an individual MCB/device, respectively. The Change and Delete functions operate on the MCB selected in the list box. The Add and Change functions use the same subdialog, as show in Fig. 42.



1. 92X at 0, 16384 channels
2. 918 at 3, 8192 channels, (16 segs)
3. 920 at 1, 16384 channels, (16 segs)

MCB# 3
Model
○ 916/17/18
○ 919
● 920
○ 921
○ 92X
○ Other

Address 1 (0 to 7)
919 Device # 3 (1 to 4)
Memory Size 16384
Segments 16 (1 to 16)
☒ Transistor Reset Preamp

Display
○ MCB ● Buffer
MCB#0 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 2048
ROI: Off

Time
Start 0:00:00
Real 0.00
Live 0.00
Dead %

Tue 30-Oct-90
14:52:47
EG&G ORTEC

Marker: 1024 = uncal 0Cnts

Fig. 42. Adding (or Changing) an MCB to Configuration.

Note that when Adding (or Changing) an MCB, some of the entry fields may be disabled (grayed) if the function is not applicable for the Model selected. For example, a 916/17/18-type will cause the "Transistor Reset Preamp" check box to be disabled.

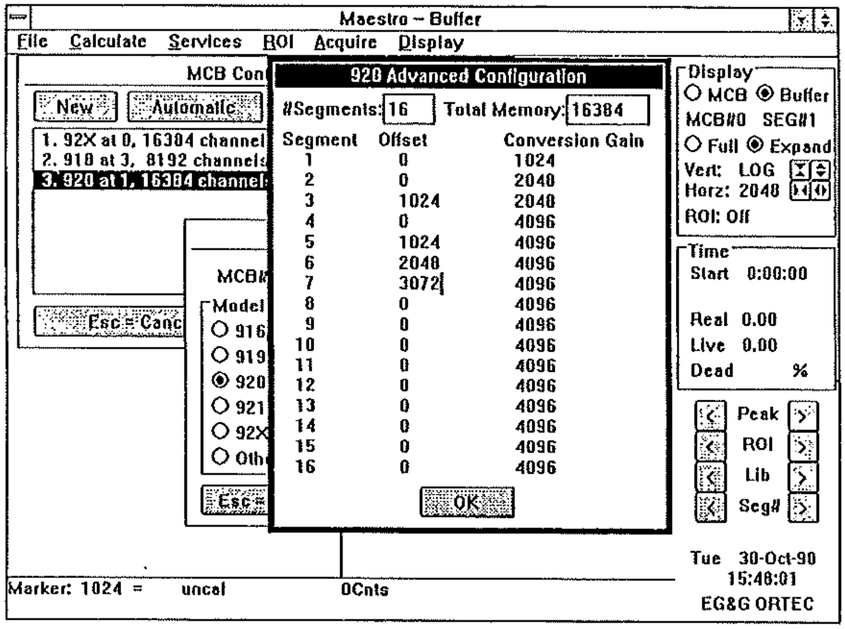
The fields in this dialog are cross checked after each entry for consistency. For example, large memory sizes allow few segments, and no segments are allowed for non-segmented models such as the 919 or 92X. The memory sizes allowed must be powers of two, and cannot be larger or smaller than certain limits, depending on the model. Only 919 models can have device numbers larger than 1. Also, only certain MCB numbers or addresses are admissible, as determined by the "vacant" positions available in the scratchpad configuration. Whenever an invalid parameter is entered, the entry is corrected and the user is warned with a "beep." When ADDing an MCB, the dialog is "filled in" with legal values as determined by the first "vacant" position in the scratchpad configuration.

Note that for many MCB types the Memory Size established by the Add... (or Change...) procedure will be reflected as a change in the conversion gain programmed to the corresponding MCB when the configuration is applied. In other words...

TO CHANGE CONVERSION GAIN OF 919 OR 92X

> Use the **Change Configuration** dialog for the selected MCB to set the **Memory Size** field to equal the desired conversion gain, then OK the change, and then **OK--Apply** the configuration, which reprograms the MCB for the specified conversion gain (memory size per input). Note that the MCB must be idle when changing the conversion gain; attempts to change conversion gain while the unit is acquiring will result in an MCB error message.

Advanced... is an option available only for certain types of MCBs requiring additional programming. As of this printing, only the 920 type provides any advanced options. The Advanced dialog for the 920 MCB is shown in Fig. 43.



1. 92X at 0, 16384 channel
2. 918 at 3, 8192 channels
3. 920 at 1, 16384 channel

920 Advanced Configuration

#Segments: 16 Total Memory: 16384

Segment	Offset	Conversion Gain
1	0	1024
2	0	2048
3	1024	2048
4	0	4096
5	1024	4096
6	2048	4096
7	3072	4096
8	0	4096
9	0	4096
10	0	4096
11	0	4096
12	0	4096
13	0	4096
14	0	4096
15	0	4096
16	0	4096

Display
○ MCB ◉ Buffer
MCB#0 SEG#1
○ Full ◉ Expand
Vert: LOG
Horz: 2048
ROI: Off

Time
Start 0:00:00
Real 0.00
Live 0.00
Dead %

Marker: 1024 = uncal 0Cnts

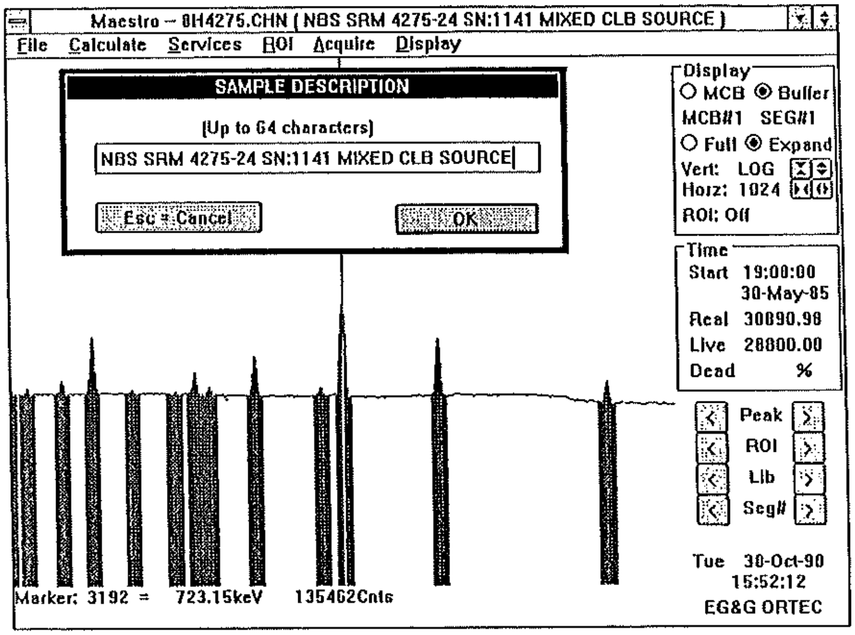
Tue 30-Oct-90
15:48:01

Fig. 43. Advanced Configuration Options for 920 MCB.

Note that the conversion gain setting for each input of a 920 is independent. Thus, the Memory Size field is not sufficient to establish the conversion gain of a 920. The Memory Size field (duplicated on the Add/Change dialog) is used to set the overall memory size for the 920, to include all inputs. If more than one segment is configured, the data are partitioned into equal parts so that the total of all segments equals the programmed Memory Size. Then, if the conversion gain for any input is less than the partitioned memory size for the corresponding segment, the MCB will write only into the lower channels of the segment. On the other hand, if the conversion gain exceeds the size of the segment, the number of channels actually written to memory is limited by the size of the segment. The Offset is useful in this latter case, since it makes it possible for an upper range of channels from the MCB to be accumulated.

6.6.2. Sample...

This function produces the dialog shown in Fig. 44 for examining, editing, or entering the Sample Description of the displayed spectrum. This description is up to 64 characters in length, and automatically accompanies the spectrum when it is subsequently copied or saved to a file. This description also appears in the Title Bar at the top of the window while the spectrum is displayed.



Maestro – 0H4275.CHN (NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE)

(Up to 64 characters)

NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 19:00:00
30-May-85
Real 30890.98
Live 28800.00
Dead %

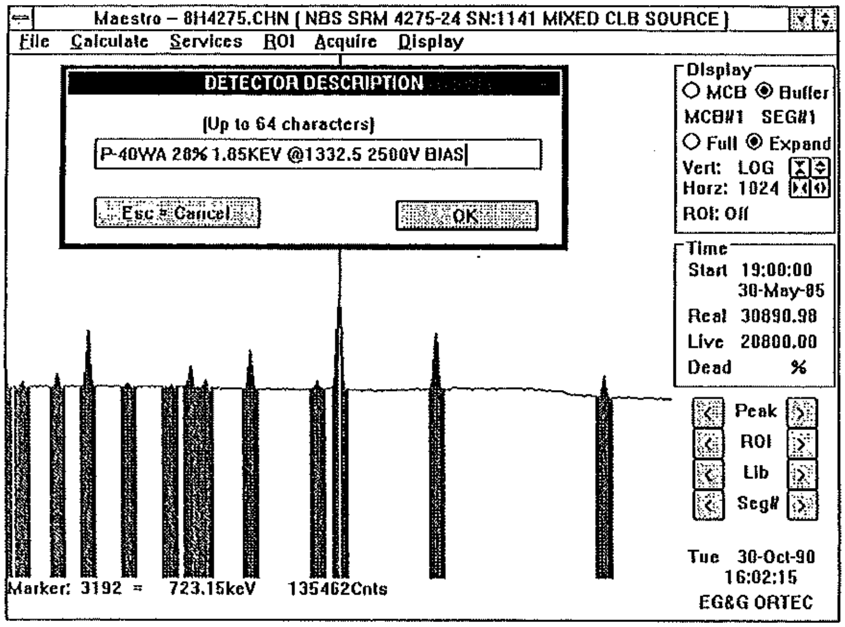
Tue 30-Oct-90
15:52:12

Marker: 3192 = 723.15keV 135462Cnts

Fig. 44. Sample Description.

6.6.3. Detector...

This function produces the dialog shown in Fig. 45 for examining, editing, or entering the Detector Description for the displayed spectrum. This description is up to 63 characters long, and automatically accompanies the spectrum when it is subsequently copied or saved to a file.



Maestro – 8H4275.CHN (NBS SRM 4275-24 SN:1141 MIXED CLB SOURCE)

DETECTOR DESCRIPTION

(Up to 64 characters)

P-40WA 28% 1.85KEV @1332.5 2500V BIAS

Display
○ MCB ● Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 1024
ROI: Off

Time
Start 19:00:00
30-May-85
Real 30890.98
Live 20800.00
Dead %

Marker: 3192 = 723.15keV 135462Cnts

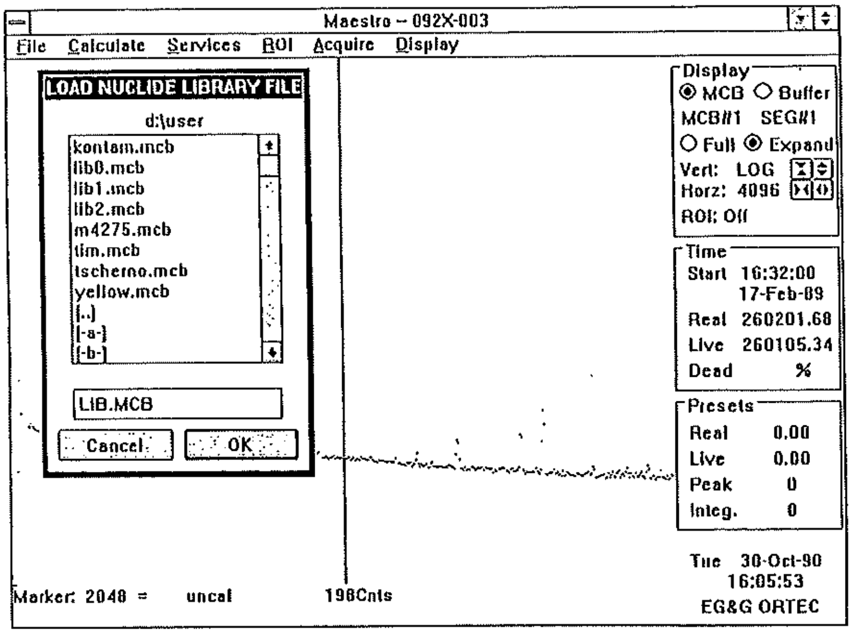
Tue 30-Oct-90
16:02:15
EG&G ORTEC

Fig. 45. Detector Description.

6.6.4. Library...

A Nuclide Library stays resident in memory after it has been loaded, and is used with reference to the Peak Search functions, Report, etc., for semi-quantitative identification and activity calculations for spectral components according to calibrated peak energy. At startup, MAESTRO automatically attempts to load the library named LIB.MCB. Thereafter, the library can be replaced through the use of the **Library...** function, which produces the dialog shown in Fig. 46.

The dialog for selecting a different nuclide library is a typical file selection dialog, with features as discussed earlier (see Section 6.5.3). The default file extension is ".MCB".


Maestro – 092X-003
File Calculate Services ROI Acquire Display
LOAD NUCLIDE LIBRARY FILE
Cancel
OK
Display
Time
Presets

d:\user

kontam.mcb
lib0.mcb
lib1.mcb
lib2.mcb
m4275.mcb
tim.mcb
tscherno.mcb
yellow.mcb
[..]
[-a-]
[-b-]

LIB.MCB

● MCB ○ Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 4096
ROI: Off

Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Real 0.00
Live 0.00
Peak 0
Integ. 0

Tue 30-Oct-90
16:05:53
EG&G ORTEC

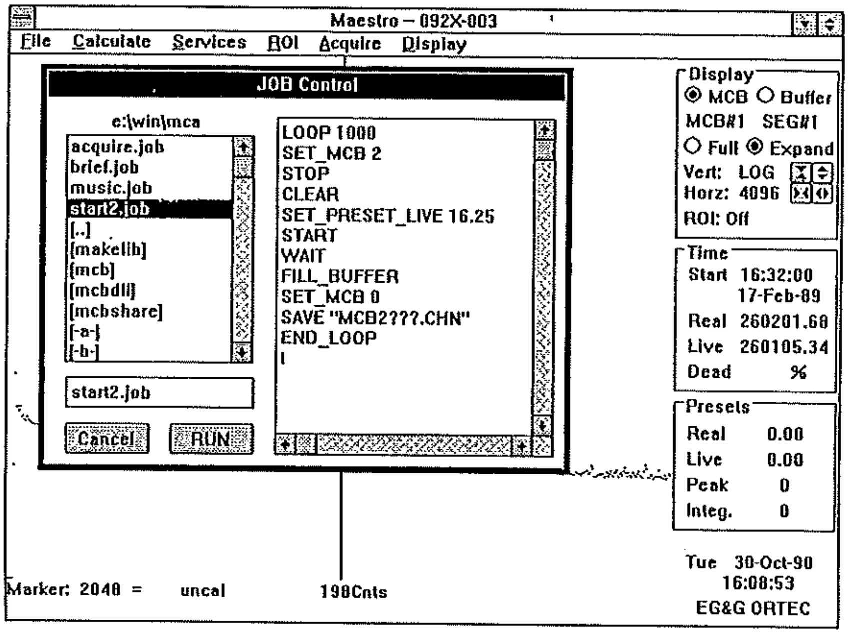
Marker: 2048 = uncal 198Cnts

Fig. 46. Nuclide Library Dialog.

Refer to Section 8 for information on the use of the MAKELIB program for creating custom Nuclide Libraries that can be loaded by this function.

6.6.5. JOB Control...

This function produces the dialog shown below for starting a Job.



```
LOOP 1000
SET_MCB 2
STOP
CLEAR
SET_PRESET_LIVE 16.25
START
WAIT
FILL_BUFFER
SET_MCB 0
SAVE "MCB2???.CHN"
END_LOOP
```

start2.job

Display
● MCB ○ Buffer
MCB#1 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 4096
ROI: Off

Time
Start 16:32:00
17-Feb-89
Real 260201.68
Live 260105.34
Dead %

Presets
Real 0.00
Live 0.00
Peak 0
Integ. 0

Marker: 2048 = uncal 198Cnts

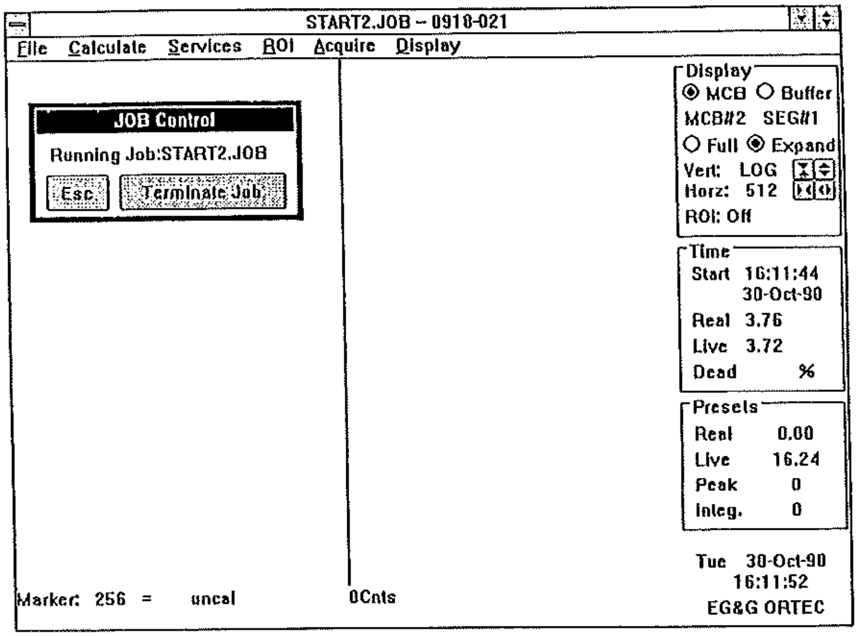
Tue 30-Oct-90
16:08:53

Fig. 47. JOB Control.

The Job file is selected with this dialog (refer to Section 6.5.3 for usage tips), then executed by pushing the RUN button. Note that while selecting Job files, the contents of the selected file are displayed in the adjoining list box for reference purposes.

After a Job is started by the use of the above dialog, most menu functions are disabled (grayed), to prevent interference with the running Job. Also, the Job file name is displayed in the window title, in place of "MAESTRO".

If a Job is already running, the JOB Control dialog is invoked differently, as shown below. In this case, the only option available is to terminate execution of the running Job.



Running Job:START2.JOB

Display
● MCB ○ Buffer
MCB#2 SEG#1
○ Full ● Expand
Vert: LOG
Horz: 512
ROI: Off

Time
Start 16:11:44
30-Oct-90
Real 3.76
Live 3.72
Dead %

Presets
Real 0.00
Live 16.24
Peak 0
Integ. 0

Tue 30-Oct-90
16:11:52
EG&G ORTEC

Marker: 256 = uncal 0Cnts

Fig. 48. JOB Control while Job is already running.

Note that whenever a Job is terminated prematurely, whether by the use of the above dialog, or because of some error condition, the user is informed by means of an error message box. The cause of the error is explained briefly in this message box, and more details can be found by cross-referencing with the error message directory in Appendix B.

7. JOB FILES

The MAESTRO Job file consists of one or more lines of ASCII text representing a series of commands that can automate most of the functions described earlier in this manual. The details of the commands and the required syntax are given in this section. A Job file can be dispatched from the "Job Control" dialog accessed via the "SERVICES" menu, or by including the name of the Job file on the command line when the application is initially started (e.g., MCA DEMO.JOB).

Job files are used for the following types of functions:

1. Performing a repetitive task, such as running a sequence of experiments without user intervention;
2. Defining initial conditions at startup (useful in preloading presets after a power loss for the 916/17/18 each time MAESTRO is run).

Job files written for previous versions of MAESTRO (e.g. MAESTRO-II or MAESTRO-PM) can be used. The Text versions of these files will work on new MCBs as well as older models with the exception of the new commands added in this version of MAESTRO.

MAESTRO has the ability to run repetitive loops. Furthermore, the current loop count can be included as a variable in any string, including filenames, program parameters, and text. Data can thus be stored with unique filenames and labeled with unique descriptions.

If an error is encountered in running a Job file, the execution of the file is stopped and control returns to MAESTRO. An error code appears in the "JOB Control..." dialog box, as described earlier.

In the following descriptions, a variable filename or text is enclosed in "..." and a variable number is enclosed in <...>; anything enclosed in square brackets [...] is optional.

7.1. Summary of Job Commands

BEEP <freq>,<duration>
Produces an audible sound of <freq> Hz, lasting <duration> milliseconds.

CALL "file.job"
Executes another Job file as a subroutine.

CHANGE_SAMPLE
Provides sample changer hardware handshake.

CLEAR
Clears the data and descriptors in the active MCB/Segment(s).

DESCRIBE_DETECTOR "text"
Enters the text into the detector description to be saved with the spectrum.

DESCRIBE_SAMPLE "text"
Enters the text into the sample description to be saved with the spectrum.

FILL_BUFFER
Transfers the data from the active MCB/Segment(s) to the Buffer.

LOAD_LIBRARY "lib.mcb"
Loads a nuclide library.

LOOP <reps>...END_LOOP
Executes all the commands between LOOP and END, <reps> number of times.

MARK_PEAKS
Sets ROIs on all peaks in the Buffer.

QUIT
Terminates this copy of MAESTRO.

RECALL "file.chn"
Reads the spectral data file to the Buffer.

RECALL_CALIB "file.chn"
Loads the calibration data from the spectrum in the disk file to the Buffer calibration parameters. The spectrum is not changed.

RECALL_ROI "file.roi"
Sets the ROIs from the table in the file.

REPORT "filename"
Writes the ROI-marked peak report to the disk filename or to the printer (PRN:).

RUN "program"
Executes an application program (.EXE by default).

SAVE "file.chn"
Saves the spectrum in the active segment(s) of the Buffer in the disk file.

SAVE_ROI "file.roi"
Saves the table of ROIs in the active segment(s) of the Buffer in the disk file.

SEND_MESSAGE "text"
Sends the text as a command to the MCB.

SET_MCB <number>
Selects the MCB (1 to 12) or Buffer (0).

SET_NAME_STRIP "file.chn"
Sets the strip file.

SET_PRESET_CLEAR
Clears all presets in active segment.

SET_PRESET_COUNT <n>
Sets the ROI Count preset to <n> counts.

SET_PRESET_INTEG <n>
Sets the ROI Integral preset to <n> counts.

SET_PRESET_LIVE <t>
Sets the live-time preset to <t> seconds.

SET_PRESET_REAL <t>
Sets the real-time preset to <t> seconds.

SET_SEGMENT <segment>
Selects the active segment (1-16) or all segments (0); or set to EXPAND if none.

SMOOTH
Smoothes the spectrum in the Buffer.

START
Starts the active segment(s).

STOP
Stops the active segment(s).

STRIP <factor>[,"file"]
Strips a spectrum file from the Buffer.

WAIT [<seconds>]
Waits a fixed number of seconds (can be fractional) or until the active segment(s) stop counting (if no seconds specified).

7.2. Job Programming Example

A common operation that is ideal for .JOB file operation is the collection of many sample spectra without user intervention. One example of this is the collection of a series of spectra to show the radioactive decay.

This process can be described as follows:

Set the MCB parameters, such as live time;

Start the acquisition;

Wait for the acquisition to stop;

Integrate the nuclide peak;

Record the peak area;

Repeat this for the required number of samples.

By looking at the list of commands above, and the explanations below, the necessary commands can be determined and written down.

The first step in the process is to initialize the MCB to the condition needed of 1000 seconds live time. These are:

```
SET_MCB 1
SET_PRESET_CLEAR
SET_PRESET_LIVE 1000
CLEAR
```

Note that all the presets were cleared before setting the live-time preset. This is to ensure that no previous presets (left over from other users) will interfere with this analysis. Now start the acquisition and wait for completion of the live time.

```
START
WAIT
```

During this time the display manipulation keys are active so that the spectrum can be studied while the collection is occurring.

Now move the spectrum from the MCB to the computer Buffer. Select the Buffer for the computational step.

```
FILL_BUFFER
SET_MCB 0
```

In the next step, the nuclide peak of interest is being marked by reading in an ROI file. This ROI file has been previously defined by looking at the spectrum and marking the peak (or the region around the peak). This ROI data is saved on the disk under the name DECAYPK.ROI. This Job file will work on different peaks or nuclides just by changing the ROI file.

```
RECALL_ROI "DECAYPK.ROI"
```

The peak areas of the marked peak or peaks is printed on the printer by this command.

```
REPORT "PRN"
```

This gives a list of the peak areas and count rates for the marked peak. If the library (LIB.MCB) has a peak near this energy then the peak identity will also be printed.

This set of instructions will only do the collection and reporting once. The commands could be repeated for as many times as needed. A more concise way is to use the LOOP command. To use this, put LOOP before CLEAR and END_LOOP after REPORT. The whole file is now:

```
SET_MCB 1
SET_PRESET_CLEAR
SET_PRESET_LIVE 1000
LOOP 10
CLEAR
START
WAIT
FILL_BUFFER
SET_MCB 0
RECALL_ROI "DECAYPK.ROI"
REPORT "PRN"
SET_MCB 1
END_LOOP
```

Note that an additional SET_MCB 1 has been inserted after REPORT, so that the loop will operate on the MCB.

Now use a text editor to enter this set of commands into a file named SAMPDATA.JOB. This file can be executed from the Services menu (JOB CONTROL Dialog) of MAESTRO.

This Job file can be improved by the addition of the saving of each spectrum on the disk. This is done by inserting the SAVE command in the text file. The spectrum sample description is also entered here. This sample description is saved with the spectrum and is printed by the REPORT command. Note that the loop counter (the ??? in the text) is used in the SAVE and DESCRIBE_SAMPLE commands.

The new file is:

```
SET_MCB 1
SET_PRESET_CLEAR
SET_PRESET_LIVE 1000
LOOP 10
CLEAR
START
WAIT
FILL_BUFFER
SET_MCB 0
DESCRIBE_SAMPLE "This is sample ???."
SAVE "DECAY???.CHN"
RECALL_ROI "DECAYPK.ROI"
REPORT "PRN"
SET_MCB 1
END_LOOP
```

Spooling the report may take some time. To overlap the data collection with the analysis, the logic of the Job file needs to be modified to restart the acquisition after the data have been moved to the Buffer. All of the analysis is performed on the Buffer spectrum so the MCB spectrum can be erased and the next one started.

The modified file is:

```
SET_MCB 1
SET_PRESET_CLEAR
SET_PRESET_LIVE 1000
CLEAR
START
LOOP 10
WAIT
FILL_BUFFER
CLEAR
START
SET_MCB 0
DESCRIBE_SAMPLE "This is sample ???"
SAVE "DECAY???.CHN"
RECALL_ROI "DECAYPK.ROI"
REPORT "PRN"
SET_MCB 1
END_LOOP
```

These few examples have shown some of the possibilities for the Job language in MAESTRO.

7.3. Job Command Details

BEEP <freq>, <duration>

This command produces an audible tone at a pitch of <freq> Hertz, lasting for <duration> milliseconds. For example, BEEP 1000,1000 is a nice annoying alarm, while BEEP 50,50 is a short "burp."

CHANGE_SAMPLE

This command is used to control the CHANGE SAMPLE output and SAMPLE READY input BNC signals on the rear panel of the 92X and 919, and is intended to initiate a hardware handshake sequence for advancing a sample changer. The SET_OUTPUT_HIGH command is sent to the currently selected MCB, then the sample-ready status is monitored (for at least 120 seconds) until the input is low, then finally the SET_OUTPUT_LOW command is sent and input is monitored until it returns to the high level again before proceeding.

Note that if the sample changer controls are not able to make the SAMPLE READY input go high very soon after the CHANGE SAMPLE signal is set (i.e., the normal state of the SAMPLE READY is low; it is expected to go high immediately after the CHANGE SAMPLE condition is set and remain high while the sample changer is moving, and returns to low when the sample changer is at its new position), then it may be necessary to use the SEND_MESSAGE command to send a SET_OUTPUT_HIGH command, then pause (with WAIT or some other time-consuming command), and then send the CHANGE_SAMPLE command. The following example demonstrates this:

```
SET_MCB 1
LOOP 5
CLEAR
START
WAIT
FILL_BUFFER
SEND_MESSAGE "SET_OUTPUT_HIGH"
SET_MCB 0
SAVE "MONTE???.CHN"
SET_MCB 1
CHANGE_SAMPLE
END_LOOP
```

CLEAR

This command clears (erases) the data, the real time and the live time for the selected segment(s). The presets are not changed. This command has the same function as the CLEAR function under the ACQUIRE menu. The command would logically be preceded by the SET_SEGMENT and SET_MCB commands as follows:

```
.
.
.
SET_MCB 1
SET_SEGMENT 1
CLEAR
.
.
.
```

DESCRIBE_DETECTOR "description"

This command accepts a 63-character description of the detector system. This description is saved with the spectrum using the SAVE command function, and is included in the REPORT printout.

The loop count value can be included in any text by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" wherever they appear.

DESCRIBE_SAMPLE "description"

This command accepts a 63-character description of the sample being analyzed. This description is saved with the spectrum using the SAVE command function, and is included in the REPORT printout. This performs the same function as the SAMPLE DESCRIPTION function under the FILES menu.

The loop count value can be included in any text by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" wherever it appears.

FILL_BUFFER

This command transfers the active MCB/Segment data to the Buffer. This command has the same function as "Copy MCB>Buffer" under ACQUIRE.

LOAD_LIBRARY "lib.mcb"

This command loads the nuclide library specified, and duplicates the function of "LOAD NUCLIDE LIBRARY" under the "SERVICES" menu.

LOOP <repetitions> ... END_LOOP

This command pair executes multiple times all the commands between LOOP and END_LOOP. The number of execution times is specified by <repetitions>. Each command must be given on a separate line. A value of 0 executes once. A LOOP with no END_LOOP statement executes once.

The loop count value can be included in any text by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" the first time the question marks appear. Spaces should be included only in the text and not in the filename. Filenames with spaces cannot easily be used by DOS commands.

The following is an example:

```
SET_MCB 1
SET_PRESET_LIVE 20
LOOP 3
SET_MCB 1
CLEAR
START
WAIT
FILL_BUFFER
SET_MCB 0
SAVE "TEST???.CHN"
END_LOOP
```

The above commands run three 20-second acquisitions and store the data on a disk in TEST001.CHN, TEST002.CHN and TEST003.CHN.

MARK_PEAKS

This command does a Mariscotti-type peak search on the spectrum in the Buffer. The peak search sensitivity is selected in the CALCULATE menu. Each peak found is marked with an ROI. If the Buffer is calibrated, the width of the ROI is three times the calculated FWHM of the peak. If the Buffer is not calibrated, the width of the ROI equals the width of the peak as determined by the peak search function. Overlapping or close peaks may have contiguous ROIs. Existing ROIs are not cleared. This command has the same function as "Peak Search" in the CALCULATE menu.

The following is an example of the MARK_PEAKS command used with REPORT:

```
.
.
.
MARK_PEAKS
REPORT "TESTDAT.RPT"
.
.
```

The above procedure does a peak-search-directed report of nuclides found, as listed in the library currently in memory (LIB.MCB by default).

QUIT

This command unconditionally terminates the MAESTRO program and returns control to Windows.

RECALL "file.chn"

This command reads a disk filename to the Buffer area. The disk file must be in the format created by SAVE. Any DOS filename, including the drive and subdirectory, can be used. The resultant segmentation of the Buffer is the same segmentation of the file. The file, the live time and the real time are restored to the proper segment. In FULL display mode (segment 0), the unused segments are set to zero; therefore, to replace only one segment, that segment should be displayed. If the spectrum file has calibration information, the calibration parameters are used to set the calibration for the Buffer.

This command has the same function as "Recall" under the FILE menu.

The loop count value can be included in the above filename, as in any text, by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" wherever they appear.

RECALL_CALIB "file.chn"

This command loads only the Buffer calibration parameters from the calibration data stored with a spectrum.

This command can be used in generating reports that include library isotope identification. The following is an example:

```
•
•
•
RECALL_CALIB "CALIB001.CHN"
MARK_PEAKS
REPORT "NEWDATA.RPT"
•
•
•
```

The report NEWDATA.RPT includes isotope identification using the energy calibration contained in CALIB001.CHN.

RECALL_ROI "file.roi"

This command marks the ROI channels in the Buffer or MCB to conform to the table in the disk file, created by SAVE_ROI or "Save File..." under the ROI menu. The data contents of the MCB or Buffer are not altered by this operation. The previous ROIs are cleared.

If the ROI file is saved for a FULL display that is segmented, then RECALL in EXPANDED mode alters only the ROIs for the active segment.

This command has the same function as "Recall File..." under ROI.

This command can be used in generating reports that look for specific isotopes (library-directed as opposed to peak-search-directed). For example, a calibration spectrum is run containing ^{57}Co and ^{137}Cs, and ROIs marked on the 122-keV and 662-keV peaks. The calibration is saved as spectrum file COBCS.CHN and as ROI file COBCS.ROI. The command sequence is:

```
.
.
.
RECALL_CALIB "COBCS.CHN"
RECALL_ROI "COBCS.ROI"
REPORT "COBCS.RPT"
.
.
.
```

These commands report the values only for the 122-keV and 662-keV peaks. Compare with the example for MARK_PEAKS.

As usual, the loop count value can be included in any text by typing three question marks in the text where the loop count is to be inserted.

REPORT "filename"

This command prints the sample and detector descriptions, the MCA number, real time and live time, the date, and Segment of the Buffer. The format of the report is described in the discussion of the FILE menu for the "Report..." function. This command has the same function as "Report..." under FILE.

The output can be printed on the printer (PRN), or sent to a disk file which can be used by other programs or printed later. The loop count value can be included in the filename by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" in the filename.

RUN "program"

This command executes an application named "program". This is typically an .EXE or .PIF file name. Note that the program will not run to completion before returning to MAESTRO unless it is run at higher priority. Thus, for simple non-windows .EXE programs, it is recommended that a .PIF file be created to cause the program to execute at higher priority or in "exclusive" mode. Refer to Microsoft documentation on creating .PIF files. See Appendix C for an example of creating AN1.PIF.

SAVE "[d:][\path\]file[.chn]"

This command, which has the same function as "Save As..." under the File menu, saves the active Segment(s) of the Buffer in a disk file. The disk filename (in quotation marks) can be any valid DOS filename; the drive [d:], path [\path\] and extension [.chn] are optional. If an extension is not supplied, the default extension is automatically .CHN. Also, the current drive and directory are used by default when the optional path specification is not supplied. The loop count value can be included in the filename by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" wherever it appears.

As for the "Save As..." function, the real time, live time, start of acquisition, and, if available, calibration data, detector description, and sample description are stored with the spectrum. In a segmented system, each segment must be saved with a separate SAVE command and stored in a separate file.

SAVE_ROI "[d:][\path\]file[.roi]"

This command, which has the same function as "Save File..." under the ROI menu, saves a table of channel numbers that have the ROI set for the active MCB/Segment(s) or Buffer in a disk file. The contents of the spectrum are not altered by this operation. The disk filename (in quotation marks) can be any valid DOS filename, with optional elements as described for the SAVE command, above. The default extension is .ROI. The loop count value can be included in the filename by typing three question marks in the text where the loop count is to be inserted. The loop count replaces "???" wherever it appears.

SEND_MESSAGE "command"

This command is used to send NIM-488 commands to the active MCB. This can be used to perform any operations of the MCB that are desired. The text must be in the syntax expected by the MCB. If the response from the MCB does not end with a command-accepted message, then this command will exit with error.

Specific MCB commands and syntax are described in the Technical Manual associated with each specific MCB. Also, a summary of a few of the more commonly used commands is included in Section 7.4.

The following is an example of using this command to set the fine and coarse gain to a total value of 50 (the product of the fine (= 0.5) and coarse (= 100) gains):

```
.
.
.
SET_MCB 1
STOP
CLEAR
SEND_MESSAGE "SET_GAIN_FINE 2048"
SEND_MESSAGE "SET_GAIN_COARSE 100"
.
.
.
```

SET_MCB <number>

This command selects the active MCB or the Buffer. The MCB number can be 1 to 12 according to the MCB configuration, or 0 for the Buffer. Also, "SET_MCB" without an argument is used to switch to the MCB previously selected. If an MCB is selected that does not exist, no change is made.

This command (for values 1 to 12) has the same function as <Ctrl+ F1> through <Ctrl+ F12>, and for value 0 or no argument at all, duplicates functions provided by the MCB/Buffer toggles under the Display menu, <F4>, <Alt+ 6>, or radio buttons in the Status area.

SET_NAME_STRIP "file.chn"

This command can be used before STRIP to select a disk filename to be used subsequently by the STRIP command. (It is not necessary to use this command, because the filename can be supplied as part of the STRIP command itself; however, the command is included in the repertoire for backwards compatibility with MAESTRO II command files.) No other action is taken by this command.

SET_PRESET_CLEAR

This command clears the presets for the active MCB/Segment. The clearing should be done to ensure that unwanted presets are not used by the MCB when the MCB is started.

NOTE: For the 916/17/18 MCBs, the new presets (including CLEAR) can be loaded at any time, but are not put into effect until the MCB/Segment goes from STOP to START. For the 919/920/921/92X, the presets can only be changed when the unit is not counting.

The SET_PRESET_CLEAR command has the same function as "Clear All" in the Presets dialog.

The MCB and MCB/Segment should be selected by the SET_MCB and SET_SEGMENT commands before the SET_PRESET_CLEAR command is given, as in the following:

```
.
.
.
SET_MCB 1
SET_SEGMENT 1
STOP
SET_PRESET_CLEAR
START
.
.
.
```

SET_PRESET_COUNT <counts>

This command sets the ROI peak count preset for the active MCB/Segment. The preset is set to the entered value. If the job is in FULL mode, the preset is set for all Segments for the active MCB. With this preset condition, the MCB stops counting when any ROI channel's content reaches this value. If no ROIs are marked in the MCB/Segment, then that MCB/Segment never meets this condition. This command has the same function as the "Peak Count" field in the PRESETS dialog; refer to the discussion describing that dialog for additional information.

SET_PRESET_INTEGRAL <counts>

This command sets the ROI Integral Count preset value for the active MCB/Segment. The preset is set to the entered value. If the system is in FULL mode, the preset is set for all Segments for the active MCB. With this preset condition, the MCB stops counting when the sum of all counts in all channels marked with an ROI reaches this limit. If no ROIs are marked in the MCB/Segment, then that MCB/Segment never meets this condition. This command has the same function as the "Integral" field in the PRESETS dialog; refer to the discussion describing that dialog for additional information.

SET_PRESET_LIVE <seconds>

This command sets the live-time preset for the active MCB/Segment. The preset is set to the entered value. If the display is in FULL mode, the preset is set for all Segments for the active MCB. The live-time preset overrides the real-time preset. With this condition, the MCB stops counting when the live time reaches this limit. The live time is the real time minus the dead time. This command has the same function as the "Live Time" field in the PRESETS dialog; refer to the discussion describing that dialog for additional information.

SET_PRESET_REAL <seconds>

This command sets the real-time preset for the active MCB/Segment. The preset is set to the entered value. If the display is in FULL mode, the preset is set for all Segments for the active MCB. The real-time preset overrides the live-time preset. With this preset condition, the MCB stops counting when the real time reaches this limit. This command has the same function as the "Real Time" field in the PRESETS dialog; refer to the discussion describing that dialog for additional information.

SET_SEGMENT <number>

This command sets the Segment in the MCB to the number that is entered. The number must be in the range specified in the configuration of the selected MCB (see Section 3). The special case of Segment 0 is used when referring to all segments (FULL mode). If the value is not in the range allowed, there is no segment change.

SMOOTH

This command smoothes the data in the Buffer; its function is the same as "Smooth" under the CALCULATE menu. A five-point, area preserving, binomial smoothing algorithm is used. The original contents of the Buffer are lost.

START

This command initiates data collection in the selected MCB/Segment. If the MCB is segmented, all Segments are started if the system is in FULL mode (see SET_SEGMENT 0). If in EXPANDED mode, only the active segment is started. This function is the same as "Start" under the ACQUIRE menu.

STOP

This command stops data collection in the active MCB/Segment(s). If the MCB is segmented, all the Segments are stopped if the system is in FULL mode (see SET_SEGMENT 0). If in EXPANDED mode, only the active segment is stopped. If the MCB has already been stopped, no operation occurs. This command has the same function as "Stop" under the ACQUIRE menu.

STRIP <factor> [,"file.chn"]

This command strips the disk spectrum specified in the SET_NAME_STRIP command or in the command itself (either way is acceptable; the filename is optional in this command) from the spectrum in the Buffer and stores the results in the Buffer. The disk and Buffer spectra must be the same size. The disk spectrum can be scaled up or down by <factor> (a constant) or, if <factor> is zero, by the ratio of the live times of the two spectra.

WAIT [<seconds>]

This command suspends execution of the Job to wait until either the active MCB/Segment(s) stops counting (in the case where the <seconds> argument is not included), or for a fixed number of seconds (which can be fractional). Note that the "wait for end of acquisition" form of the command (i.e., no argument) will suspend the Job indefinitely if there are no preset conditions that can get satisfied (i.e., if acquisition proceeds indefinitely).

7.4. Selected 92X Commands

Included here are a few of the more commonly used 92X commands, some of which are used in the "SEND_MESSAGE" programming examples. For complete descriptions of these commands, responses from the modules and how to interpret them, and for a list of all the commands, refer to the Hardware Reference Manual for the device being controlled.

PAUSE_INPUT_HIGH
This command causes the 92X to wait until a high level is detected on the sample ready input or the next command is received before responding with a percent response record (e.g., %000000069). The external device must keep the sample-ready input level high until the MCB responds or it may not be detected.

PAUSE_INPUT_LOW
This command causes the 92X to wait until a low level is detected on the sample ready input or the next command is received before responding with a percent response record. The external device must keep the sample-ready input level low until the MCB responds or it may not be detected.

SET_OUTPUT_HIGH
This command sets the **CHANGE SAMPLE** output to a high level.

SET_OUTPUT_LOW
This command sets the **CHANGE SAMPLE** output to a low level.

SET_GAIN_ADJUSTMENT <VALUE>
This command sets the gain adjustment to <VALUE>.

SET_GAIN_CHANNEL <VALUE>
This command sets the center channel of the region used for the gain stabilizer peak to <VALUE>. If <VALUE> is chosen such that the beginning channel would be below channel 0 or the ending channel would be above the maximum channel (determined by the conversion gain), the gain peak width is reduced until the peak fits the device boundaries. This command cannot be attempted while gain stabilization is enabled.

SET_GAIN_COARSE <VALUE>

This command sets the amplifier coarse gain to one of the allowed values. The allowed values are:

0	Coarse gain set to default (10X)
20	Coarse gain set to 20X
40	Coarse gain set to 40X
100	Coarse gain set to 100X
200	Coarse gain set to 200X
500	Coarse gain set to 500X
1000	Coarse gain set to 1000X

SET_GAIN_CONVERSION <VALUE>

This command sets the conversion gain to one of the allowed values. The allowed values are:

0	Conversion gain set to default (16384)
512	Conversion gain set to 512 channels
1024	Conversion gain set to 1024 channels
2048	Conversion gain set to 2048 channels
4096	Conversion gain set to 4096 channels
8192	Conversion gain set to 8192 channels
16384	Conversion gain set to 16384 channels

SET_GAIN_FINE <VALUE>

This command sets the fine gain to <VALUE>.

ENABLE_HV

This command enables the high voltage output on the rear panel of the Model 92X. The voltage selected on the rear panel of the Model 92X will be present on the high voltage output within 60 seconds after this command is received, unless the output is overloaded or the output is shut down by the high voltage shutdown.

DISABLE_HV

This command disables the high voltage output on the rear panel of the Model 92X. With no external load on the high voltage output, the output will remain present for approximately 60 seconds.

ENABLE_GAIN_STABILIZATION

This command enables the gain stabilization. It can only be used after the gain stabilization has been initialized.

DISABLE_ZERO_STABILIZATION

This command stops stabilization of the zero peak while data are being acquired. The zero stabilization adjustment is held at its current value until either zero stabilization is re-enabled with the ENABLE_ZERO_STABILIZATION command or reinitialized with the INITIALIZE_ZERO_ADJUSTMENT command.

DISABLE_GAIN_STABILIZATION

This command stops stabilization of the gain peak while data are being acquired. The gain stabilization adjustment is held at its current value until either gain stabilization is re-enabled with the ENABLE_GAIN_STABILIZATION command or reinitialized with the INITIALIZE_GAIN_ADJUSTMENT command.

ENABLE_ZERO_STABILIZATION

This command enables the zero stabilization. It can only be used after the zero stabilization has been initialized.

INITIALIZE_GAIN_ADJUSTMENT

This command resets the gain peak stabilization adjustment to unity (no adjustment). This value is reported as 2048 by the SHOW_GAIN_ADJUSTMENT command.

INITIALIZE_ZERO_ADJUSTMENT

This command resets the zero peak stabilization adjustment to unity (no adjustment). This value is reported as 2048 by the SHOW_ZERO_ADJUSTMENT command.

8. UTILITY PROGRAMS

The MAESTRO software package includes utility programs to support its operation, including MAKELIB, a program which converts a library text file into a library file for use by MAESTRO. Such programs are not required during operation of MAESTRO, but are furnished only to support the preparation of data required by (or presentation of data produced by) MAESTRO.

8.1. MAKELIB

The MAKELIB program converts a library text file into a library file in the format required by MAESTRO. Such a file (LIB.MCB by default) is loaded automatically when MAESTRO is started, and can also be loaded using the LIBRARY... function under the FILE menu.

The program is invoked by a command of the following form:

```
MAKELIB library.txt library.mcb
```

where **library.txt** is the name of a library text file as described below, and **library.mcb** is the desired name of the library file to be produced. Note that if the library filename (library.mcb) is not supplied, then the name "LIB.MCB" is automatically assumed.

The library text file contains a series of text lines (terminated by Carriage Returns) specifying one isotope per line in the following format:

<Energy> <Name> <Factor>

where <Energy> is the energy of the gamma ray in keV, <Name> is the name of the isotope (must be exactly 7 characters), and <Factor> is a real number me> to obtain the corrected net count rate in the REPORT function (use Factor of 1.0 for no correction). All fields or each line are separated by spaces.

The text file can be created by any programming text editor that doe not put special codes in the text. Note that the library must be ordere in ascending energy. (If the input energies are entered with the decima point in the same position for all lines, then the SORT program can be used to arrange the library in energy order.)

The following is an example of a short TXT file created by an editor, sorted and ready for input to MAKELIB:

```
  14.4100 CO-57          1.0
  31.8171 CS-137         1.0
  32.1936 CS-137         1.0
  36.4000 CS-137         1.0
 122.0630 CO-57          1.0
 136.4760 CO-57          1.0
 661.6600 CS-137         1.0
 802.0000 CS-137         1.0
1173.2370 CO-60          1.0
1332.5010 CO-60          1.0
2616.0000 CO-60          1.0
```

This library file can be created using the ULI program (B30-BI) with the factor being set to either the branching ratio (yield or gammas per disintegration) or the calibration factor for this peak energy calculated from the full-efficiency calibration of CLB (B30-BI). In the latter case, the report will give the activity of the nuclide based on the peak ROI area.

8.2. PLOTS

> NOTE: As of this printing the PLOTS program operates only as a pure DOS program, not as a true Windows application. Furthermore, a plotter should be properly connected to the COM port before executing this program.

This program plots spectrum files (either .CHN or .SPC) only on an HP 7470A or equivalent plotter that uses the HPGL interface. Sample plots are shown in Figs. 43 and 44. The operator can select the start and stop channels or energies for the plot, the RS-232 port to which the plotter is connected, whether the plot will be in 6-decade logarithm mode or linear mode, and whether to specify the scale maximum in linear mode or use autoscale. In linear mode, the vertical scale (peak height) is rounded upward to the next decade (i.e., 34,970 to 40,000; 450 to 500). The descriptions in the file (sample, detector, calibration) can be plotted or suppressed.

The PLOTS program requires the plotter to be set to the following:

2400 baud
8 bit word
1 stop bit
No parity
U. S. paper size

The command line (entered at the DOS Box command prompt) is

```
PLOTS FILE:spcfil PORT:i FROM:x TO:y LINEAR NOHEAD ENERGY
```

where:

spcfil	is the input spectrum file. The default extension is .CHN. If the file does not exist, the program exits.
i	is the port number for the plotter cable (COM1 = 1, COM2 = 2).
x	is the start channel or energy for the plot. The default is the beginning of the file. Real numbers may be used.
y	is the stop channel or energy for the plot. The default is the end of the data. Real numbers may be used.
LOG	specifies a logarithmic vertical scale. The default is LOG.
LINEAR	specifies a linear vertical scale. The default is LOG. LINEAR and LOG are complementary commands.
NOHEAD	suppresses the descriptions in the file. The default is to print the descriptions.
CHANNEL	specifies the plot to be in channels. The default is channels.
ENERGY	specifies the plot to be in energy (keV). The default for channel/energy is channels. If the input file is not calibrated, a channel plot is made. CHANNEL and ENERGY are complementary commands.

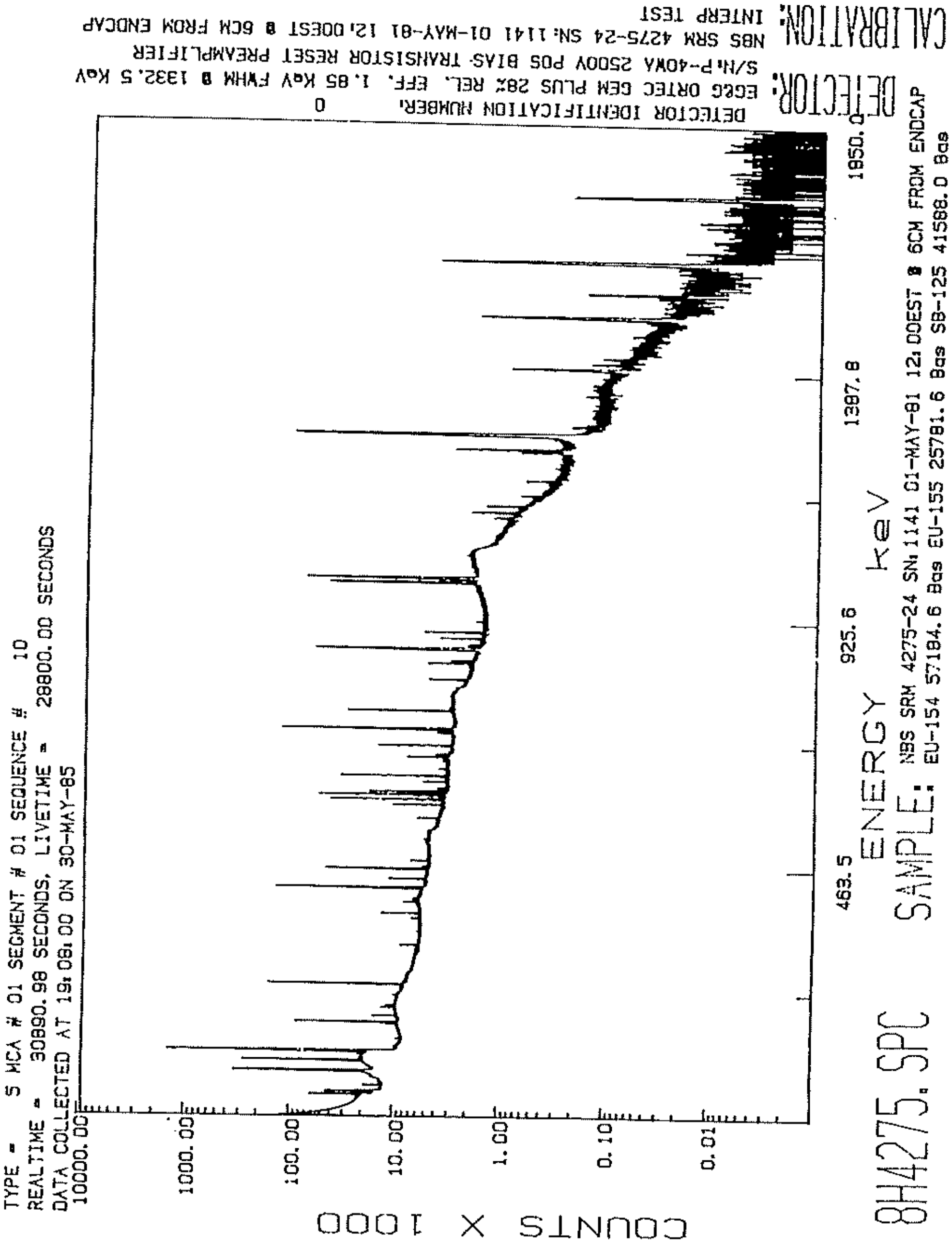


Fig. 49. Sample Plot (with Calibration).

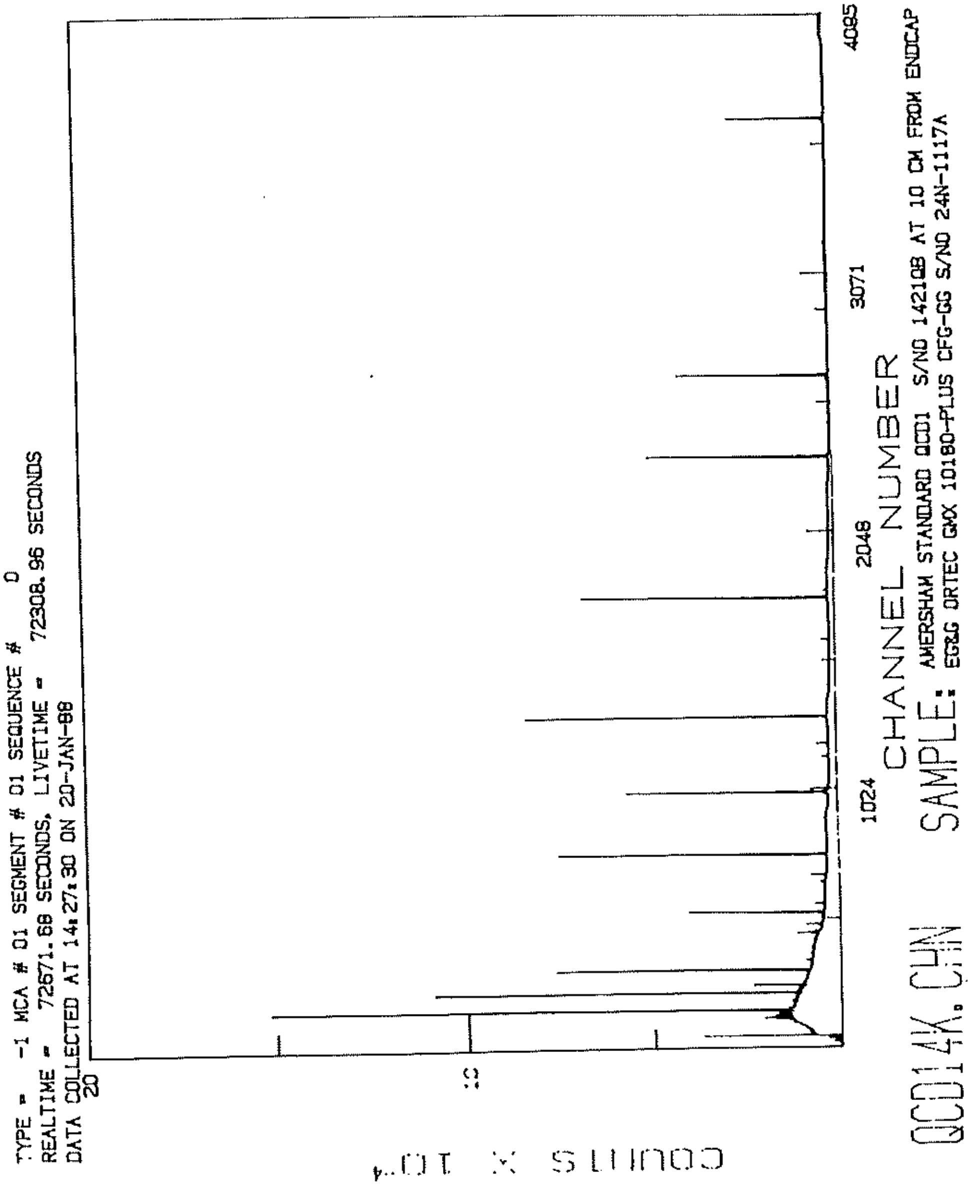
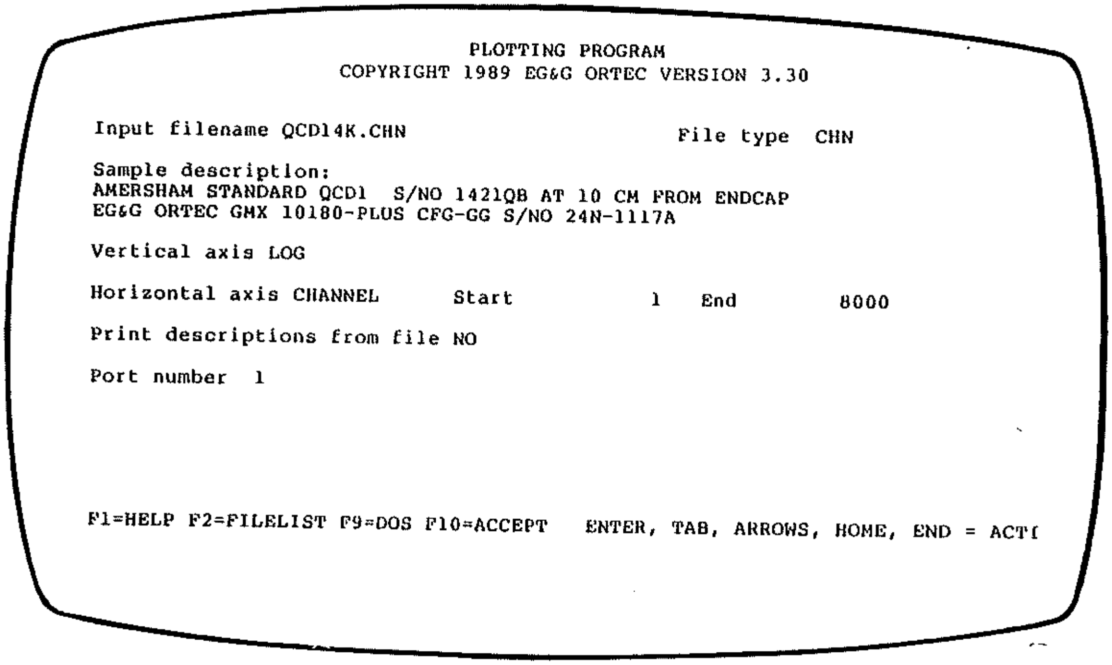


Fig. 50. Sample Plot.

The PLOTS main menu is shown in Fig. 51. The same menu is used for all types of input files.



```
                           PLOTTING PROGRAM
                COPYRIGHT 1989 EG&G ORTEC VERSION 3.30

Input filename QCD14K.CHN                         File type  CHN

Sample description:
AMERSHAM STANDARD QCD1  S/NO 1421QB AT 10 CM FROM ENDCAP
EG&G ORTEC GMX 10180-PLUS CFG-GG S/NO 24N-1117A

Vertical axis LOG

Horizontal axis CHANNEL      Start          1   End         8000

Print descriptions from file NO

Port number  1




F1=HELP F2=FILELIST F9=DOS F10=ACCEPT   ENTER, TAB, ARROWS, HOME, END = ACTI
```

Fig. 51. PLOTS Menu.

Input Filename

This is the name of the file to be plotted. If the extension is not entered, the extension shown in the filetype field will be the default extension. <F2> will show the available files for the default extension filetypes. Any extension may be entered, but the filetype field will still show the actual filetype. To step to the filetype field, use <→> or <←>. <Enter> will update the filetype and jump to the sample description field.

Filetype

This field shows the filetype and default extension of the input filename. Select from the options of .CHN, .SMP and .SPC by using the <Space Bar>. The most common use of this entry is to select a filetype, return to the input filename menu, and press <F2> for a list of these files. Changing this field without returning to the input filename field has no effect on the input filename.

of these files. Changing this field without returning to the input filename field has no effect on the input filename.

Sample Description

These two 64-character lines are plotted below the horizontal axis of the plot. They may be changed here and the changes will be put on the plot. The changes are not written to the file.

The default values for the sample description are the 128 characters in the sample description field for the .SPC file and the 63 characters from the sample description and 63 characters from the detector description for the .CHN files. If these are not found the default is all spaces.

Vertical Axis

The two choices are log and linear. The <Space Bar> can be used to toggle between the two. The log scale is a 6-decade log for 10,000,000 full scale. The linear scale is set in the vertical scale maximum field.

Vertical Scale Maximum

This value is used to set the maximum value for the vertical or counts axis. The input is rounded up to the next integer times a power of ten. Thus, 450 becomes 500 and 8473 becomes 9000. To specify a particular value, enter a slightly smaller number, like 8900 for 9000. The default value is 0 which means to use the maximum value in the plotted portion of the spectrum.

Horizontal Axis

If the spectrum to be plotted is calibrated, the plot can be either in energy or channel numbers. If the spectrum is not calibrated, this value is set to channel and cannot be altered. The default is channels.

Start End

These are the limits for the plot. If the plot is in channels, these are in channel numbers and the defaults are the lower and upper channels in the file. If the plot is in energy, these are in energy (keV) and the defaults are the energies corresponding to the lower and upper channels in the file.

Print Descriptions from File

If YES, the sample description, from above, is printed below the horizontal axis of the plot. If this is a plot of an .SPC file, the detector and calibration descriptions, if any, are plotted on the right margin of the paper.

Port Number

This selects the COM port that is connected to the plotter; either 1 or 2.

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Appendix A. FILE FORMATS

This appendix describes the file structure for the spectrum data files, the ROI data files, and gives example programs that access the spectrum files.

A.1. CHN Spectral Data Files

The .CHN spectral data files contain the channel-by-channel contents of the MCB in 32-bit integer format. The header is 32 bytes long and contains the following:

Byte Offset	Byte Length	Use
0	2	Must be -1
2	2	MCA number
4	2	Segment number
6	2	ASCII seconds of start time
8	4	Real time (increments of 20 ms)
12	4	Live time (increments of 20 ms)
16	8	Start date as ASCII DDMMMYY0, or binary zeros, if not known
24	4	Start time as ASCII HHMM, or binary zeros, if not known (see Byte 6 above)
28	2	Channel offset of data
30	2	Number of channels (length of data)
	32	

The next part of the file contains the spectrum stored as 32-bit integers. There are no record separators in the file. The number of spectrum records is determined by the number of channels in the spectrum.

The last part of the spectrum file contains additional descriptive information about the spectrum, as follows (the byte offsets are relative to the end of the spectrum):

Byte Offset	Byte Length	Use
0	2	Must be -101
2	2	Reserved
4	4	Energy calibration zero intercept, 0.0 for uncalibrated spectrum
8	4	Energy calibration slope, 1.0 for uncalibrated spectrum
12	4	Reserved
16	4	Peak shape calibration zero intercept, 1.0 for uncalibrated spectrum
20	4	Peak shape calibration slope, 0.0 for uncalibrated spectrum
24	232	Reserved
256	1	Length of detector description
257	63	Detector description
320	1	Length of sample description
321	63	Sample description
384	128	Reserved (The total length is 512 bytes.)
	512	

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A.2. ROI Files

This file is created by SAVE-ROI and contains a list of the start and stop channels for the ROIs in the display. The file contents are as follows:

Byte Offset	Byte Length	Use
0	2	Must be -2
2	2	Start channel number of first ROI
4	2	Stop channel number of first ROI
.		
.		
.		
		Continue for all ROIs in the display
n	2	Start channel = -1 is end of data

A.3. Program Examples

The following examples show how to read .CHN data files and ROI region-of-interest files. These are simple program segments to illustrate the programming details needed.

A.3.1. FORTRAN Language

This section contains two routines; one to access the .CHN files and one to access the ROI files.

CHN Files

```
C This program prints the header data from a MAESTRO data file
C and the contents of a channel.
C
      INTEGER*2 TYPE,MCA,SEG,STRTCH,LNGTDT,SPCOUI(64)
      INTEGER*2 BEGREC,ENDREC
      INTEGER*2 TLRTYP,IS
      INTEGER*4 SPCIN(32),LVETME,RLTIME
      REAL*4 ENG(2),FW(2),X1
      CHARACTER*1 SRTTME(4),SRTSEC(2),SRTDTE(8),OUTPUT(30)
C
C     START
C
      WRITE(0,100)
100   FORMAT(29X,'SPECTRUM PRINT ROUTINE',//)
C  Open the spectrum file
      OPEN(1,FILE=' ',STATUS='OLD',ACCESS='DIRECT',RECL=32)
C  Read the first 32 bytes (first record) from the file
      READ(1,REC=1) TYPE,MCA,SEG,SRTSEC,RLTIME,LVETME,
     1 SRTDTE,SRTTME,STRTCH,LNGTDT
C  Check to see if the first word is a numeric -1, if not
C      then quit
      IF(TYPE.NE.-1) GO TO 1000
C  It's good, so write out all the data from the header,
C  note that the start time is split into two parts
      WRITE(0,150) TYPE,MCA,SEG,RLTIME/50,
     1  LVETME/50,SRTTME,SRTSEC,SRTDTE,STRTCH,LNGTDT
150   FORMAT(' TYPE = ',I4,' MCA # ',I2,' SEGMENT # ',
     1  I3,/,' REALTIME = ',I10,' SECONDS, LIVETIME = ',
     2  I10,' SECONDS',/,' DATA COLLECTED AT ',2A1,':',2A1,
     3  ':',2A1,' ON ',2A1,'-',3A1,'-',3A1,/,
     4  ' STARTING CHANNEL = ',I6,' NUMBER OF CHANNELS = ',
     5  I6,//)
C  The first trailer record is after the last channel data.
C  Divide the length by 8, because there are 8 channels per
C  record.
       LREC=3+(.CHNLEN-1)/8
C  Read the first trailer record.  TLRTYP is the record type
C  The variables IS and X1 are dummys maintain the position
C  in the file.
       READ(LUN,REC=LREC,ERR=100)TLRTYP,IS,ENG(1),ENG(2),
     1  X1,FW(1),FW(2)
       WRITE(0,160) ENG,FW
160    FORMAT(' ENERGY ZERO = ',E14.8,/,' ENERGY SLOPE = ',
     1 E14.8,/,' FWHM ZERO = ',E14.8,/,' FWHM SLOPE = ',E14.8)
 C  Ask the user for the channel number to print out
       WRITE(0,200)
200    FORMAT(' Enter channel number: ',\)
C  Get the channel number
       READ(0,210) I.CHNNL
210    FORMAT(I5)
C  Calculate the block of 8 channels that this one is in.
C  There are 8 channels in a record of 32 bytes.
       CHANEL=I.CHNNL-1
       ENDREC=CHANEL/8.
       BEGREC=CHANEL/8.
C  This is only one record in this example, but could be any
C  number of records.  The 2 is the offset past the header
C  and the records start at 1.  So the first data record is 2.
       DO 450 I=BEGREC+2,ENDREC+2
C  Read the 8 channels
          READ(1,REC=I) (SPCIN(K),K=1,8)
C  Print the 8 channels along with the channel number of
C  the first channel
          WRITE(0,410) 1+8*(I-2),(SPCIN(K),K=1,8)
410       FORMAT(1X,I5,8I9)
450    CONTINUE
       CLOSE(1)
1000   STOP
       END
```

ROI Files

```
INTEGER*2 LUNROI,LSTREC,IBEGIN,IEND
C
      WRITE(0,100)
100   FORMAT(29X,'ROI PRINT ROUTINE',//)
C  Open the ROI file
      OPEN(1,FILE=' ',STATUS='OLD',ACCESS='DIRECT',RECL=2)
C  Read the ROIs
      I=0
      IROI=1
C  Add 2 to skip past the header
200   READ(1,REC=I+2) IBEGIN
C  If the entry is 0 then this is the end of the list
      IF(IBEGIN.LE.0) GO TO 1000
C  If the beginning is there then the end is also
      READ(1,REC=I+3) IEND
C  But its one too many
      IEND=IEND-1
C  Write them all out
      WRITE(0,220) IROI,IBEGIN,IEND
220   FORMAT(' ROI # ',I3,' START ',I6,' STOP ',I6,)
C  Add 2 to I to advance past the begin and end numbers
      I=I+2
      IROI=IROI+1
C  Keep going until we run out of numbers
      GO TO 200
1000  STOP
      END
```

A.3.2. C Language

```
/**********************************************************/
/*  Sample program compatible with Microsoft and Borland C  */
/*  to read header and channel data from a .CHN data file.  */
/**********************************************************/
#include <stdio.h>
#define  .CHN   -1
main(argc,argv)
   int   argc;
   char  *argv[];
   {
    char       acq_time[32];    /* buffer for time, date */
    int        f_type;          /* .CHN file type */
    unsigned int  chan_offset, /* beginning channel number */
               count,           /* loop counter */
               mca_num,         /* 1-4 are valid */
               num_chans,       /* no. of data channels */
               num_writ,       /* no. of bytes written out */
               segment;         /* segment number */
    long int   livetime,        /* 20ms tics of livetime */
               realtime,        /* 20ms tics of realtime */
               chan_data;       /* stores channel data */
    FILE       *f_pointer;
   if (argc != 2)
      {
      printf("USAGE:readchn filename.chn\n");
      exit(1);
      }
    f_pointer = fopen(argv[1],"rb");

/**********************************************************/
/*                       Header Data                        */
/*            Output header info from .CHN file             */
/**********************************************************/
/* Read filetype -1 (.CHN) */
   fread(&f_type,sizeof(int),1,f_pointer);
   if (f_type != .CHN) {
      printf("Not a valid file\n");
      exit(1);
      }
   fread(&mca_num,sizeof(int),1,f_pointer); /* MCA number */
   fread(&segment,sizeof(int),1,f_pointer); /* segment #  */
   fread(acq_time+12,sizeof(char),2,f_pointer);/*start time */
   fread(&realtime,sizeof(long),1,f_pointer);/* 20ms ticks */
   fread(&livetime,sizeof(long),1,f_pointer);/* 20ms ticks */
   fread(acq_time,sizeof(char),2,f_pointer); /* start date */
   fread(acq_time+2,sizeof(char),3,f_pointer);/* start month*/
   fread(acq_time+5,sizeof(char),3,f_pointer);/* start year */
   fread(acq_time+8,sizeof(char),2,f_pointer);/* start hour */
   fread(acq_time+10,sizeof(char),2,f_pointer);/* start mins*/
   fread(&chan_offset,sizeof(int),1,f_pointer);/* offset */
   fread(&num_chans,sizeof(int),1,f_pointer);/* #channels  */

   printf( "TYPE = %4i MCA# %2i\n", f_type, mca_num );
   printf( "SEGMENT # %3i\n", segment );
   printf( "REALTIME = %10li SECONDS\n", realtime/50 );
   printf( "LIVETIME = %10li SECONDS\n", livetime/50 );

   printf( "DATA COLLECTED AT " );
   fwrite( acq_time+8, sizeof(char), 2, stdout );
   putchar(':');
   fwrite( acq_time+10, sizeof(char), 2, stdout );
   putchar(':');
   fwrite( acq_time+12, sizeof(char), 2, stdout );

   printf(" ON ");
   fwrite( acq_time, sizeof(char), 2, stdout );
   putchar('-');
   fwrite( acq_time+2, sizeof(char), 3, stdout );
   putchar('-');
   fwrite( acq_time+5, sizeof(char), 2, stdout );

   printf("\nSTARTING CHANNEL = %6in",chan_offset);
   printf("\nNUMBER OF CHANNELS = %6i\n\n",num_chans);
/*********************************************************/
/*                     Channel Data                      */
/*           Output channel data from .CHN file          */
/*********************************************************/

   printf("CHANNEL    DATA\n");
   for (count = 0; count < num_chans; count++)
      {
      if ((count % 6 ) == 0)      /* 6 channels per line */
           printf ("\n%7i",count);  /* with channel number */
      fread(&chan_data,sizeof(long),1,f_pointer);
      printf("%11i",chan_data);
      }

   fcloseall();
 }
```

Appendix B. ERROR MESSAGES

Errors are displayed in warning boxes, or in some cases in the information line at the bottom of the window.

Acquisition failure.
  For some reason an acquisition function failed from a Job file.

Already started.
  MCB already active when a Start Acquisition command was issued.

Altering MCB data.
  Restoring data to an MCB would destroy the data already there.

Amplifier not pole-zeroed.
  Warning from a 92X indicating that the MCB should be pole-zeroed.

Auto PZ aborted.
  The 92X Auto PZ function was aborted (by <Esc>).

Buffer and MCB not same size or segments.
  Error when trying to restore data which does not match the MCB configuration.

Calibration per channel wrong.
  Error when trying to calibrate spectrum, arising whenever the calibration slope would be 0, negative or greater than 100 units per channel.

Can't allocate memory for library.
  Attempting to load a library for which there is not enough room in memory. Best dealt with by trying again or removing some other applications from memory.

Can't Find Any More ROIs.
  Attempting to index to the next ROI in a direction for which no more ROIs can be located.

Can't load library file.

Attempting to open or read the library file resulting in some kind of file I/O error, usually because the file doesn't exist, but also possibly because the disk is defective.

Can't RESTORE to acquiring MCB.

Error preventing the Restore function from altering data in an MCB in which one or more segment(s) are actively acquiring data.

Comm. Failure!

MCB communication failure, most likely resulting from a timeout (the MCB failed to respond within a reasonable period of time).

Configuration failed!

Attempted reconfiguration failed, most likely because of some conflict with MCBs physically installed.

Could not properly fit the peak.

Function requiring a fitted peak could not obtain an acceptable peak, probably because of too few counts, too narrow or non-Gaussian peak shape, or bad statistics such as calculated sigma-squared less than zero.

Couldn't get background subtracted ROI.

A function requiring a background subtracted ROI couldn't obtain such, probably because there was no ROI at the point specified, or maybe because there weren't statistically significant counts above background.

Default Printer Failure

The REPORT or PRINT function was aborted because the default system printer has not been properly setup. Refer to the Control Panel "Printers" function; install the appropriate printer and select it as outlined in the Microsoft Windows documentation.

Do you want to save buffer?

A function that would destroy the Buffer (such as COPY or EXIT) queries the user unless the Buffer has not been modified since last being saved.

Error opening file.

If trying to write a file, this would indicate a disk controller problem such as a full disk. If trying to read a file, this would indicate that the filename specified could not be found.

Error reading file -- STRIP aborted.

Could not read the file requested for stripping.

Error reading file.

File read error is usually a result of damaged media.

Error writing file.

File write error is usually a result of damaged media or full disk.

Failure obtaining ROI (or Peak).

A function that requires a defined ROI (or Peak, in the case of the Calibrate function) when the Marker is not placed in a channel with an ROI bit set (and if a Peak is not very close by).

Failure with MCB function.

This error arises from a Job that encounters an error when trying to access an MCB.

File already exists!

If the file output function requested would write a file with the same name as another file that already exists, the user is prompted for confirmation of the operation by this warning. See also "OK To Overwrite Existing File?"

File is wrong size -- Can't STRIP.

The STRIP function requires a compatible file for stripping from the spectrum in memory; i.e., must contain the same number of channels.

Fine gain is at limit of ...

This message appears in the Information Line when an attempt is made to change the 92X gain setting with the keyboard function, but while the 92X cannot be decreased or increased any further.

Hardware failure!

This message appears as the result of an MCB execution error with micro code 137, indicating a hardware failure.

High voltage not enabled.

START was attempted on a 92X while the High Voltage was not enabled.

Illegal MCB.

The MCB number for the requested function was not identifiable as part of the active configuration.

Illegal segment.

A Job tried to specify a Segment number which was invalid for the selected MCB or Buffer.

Install MCB device driver.

The MCB.SYS device driver has not been properly installed.

Insufficient memory for buffer.

The Buffer could not be created due to insufficient available memory in the system. Sometimes this error can be eliminated by attempting the Buffer operation again, but this is not recommended due to the marginal state of the system, which might result in other errors.

Invalid Device or Segment!

This message arises as a result of an MCB execution error with micro code 134, indicating that an invalid device or Segment was selected.

Invalid File Format!

A function to recall a file could not obtain data in the proper format.

Invalid library file.

An attempt was made to load a nuclide library from a file which was not in the proper format.

Invalid Start Date/Time -- Battery Backup Lost??

A 919 or 92X MCB contained an unrecognizable start date. This is usually an indication that the backup power was lost.

Invalid Start Record.

No valid Start Record file could be found to provide the start date/time for an installed 917 or 918 MCB.

Job Aborted or Premature EOF.

A Job was aborted by the user, or an End-Of-File was encountered while trying to obtain a command from the executing Job file.

Job Error.

A generic error message indicating that an error was encountered while executing a Job file. Usually some explanatory phrase is given.

MCB #.. ; .... ; Error ... (Macro) ... (Micro)

An unresolved error originating in the MCB. The offending MCB command is shown, together with the macro and micro error codes. If the error persists, the error codes should be recorded and the factory should be contacted.

MCB busy with other tasks, not responding.

This indicates the MCB was unable to respond within a certain time limit, due to other activities, such as multiple instances of MAESTRO accessing the MCB at the same time, or otherwise heavy use of the MCB interface.

MCB Error!

The selected MCB could not be STARTed or STOPped due to some unresolved error condition.

MCB Not Located.

A MCB could not be located at the configured address.

Multiple-device MCB added.

While performing the CONFIGURATION dialog function ADD, a 919 device type was specified, and there is room to add up to four MCBs for each 919 device added; the ADD function is automatically repeated for each possible MCB number.

Must choose separated peaks!

This error arises when a CALIBRATION is attempted using two identical or too-closely-positioned peaks.

Must select 92X-type MCB!

This error results from an attempt to perform a function available for only 92X-type MCBs.

Need an ROI at the desired peak location.
The Stabilizer function requires a valid ROI at the desired peak.

No Buffer to RESTORE from!
The RESTORE function requires a valid spectrum in Buffer.

No close library match.
The REPORT function could not obtain a library entry close enough the located peak.

No File Name.
A file function was requested without specifying the filename adequately.

No more peaks, or can't reach.
A peak search was attempted in a direction where no more can be found.

No peaks found.
The peak search function could not find any valid peaks in the spectrum.

No ROI There To Clear.
The ROI Clear function (DEL key) requires at least one channel at the marker with the ROI bit set.

No segment selected.
The MCB function could not be performed because no Segment was selected.

No Start Channel Was Defined.
The ROI "END" function was attempted without properly performing the "BEGIN" function.

Not Allowed During Acquisition!
An execution error (micro 135) arising from the MCB, indicating that the MCB command is not allowed while acquisition is in progress.

Not Allowed During Current Mode!
An execution error arising from the MCB (micro 136), indicating that the MCB command attempted is not allowed in the current mode of operation.

Not enough memory -- STRIP aborted.

The STRIP function temporarily allocates enough memory to read the file, but the allocation failed in this case, probably due to insufficient available memory in the system. The STRIP function is discontinued.

Not enough memory for COMPARE.

The COMPARE mode could not be executed due to insufficient memory for the second spectrum.

OK to add another device?

When a 919 device is being added in the CONFIGURATION dialog, the operator is prompted for confirmation before automatically proceeding with the addition of up to 4 MCB numbers.

OK to destroy contents of MCB?

The RESTORE function prompts the user for confirmation before writing the contents of the Buffer into the MCB.

OK to overwrite '...' ?

A file output function discovered that the specified filename already exists, and will only overwrite the file after the user confirms his intentions. See also "File already exists!"

OK to use it anyway?

A new configuration was applied but failed due to some conflict with the MCBs physically present; it is possible to use the configuration anyway by answering Yes to this query.

Peak rejected for asymmetry.

Peak statistics could not be obtained for the function due the calculated non-Gaussian asymmetry of the obtained peak.

Preset already reached.

Acquisition START was attempted on an MCB or Segment which had already satisfied the preset condition(s) in some way.

Presets can't be changed during acquisition.

Changes in the preset condition(s) are not allowed while the MCB is actively acquiring.

Problem with Buffer.
A Job error resulting from some problem with a Buffer, usually indicating insufficient memory to create or enlarge a Buffer as needed.

Problem with Calculation.
A Job error resulting from a problem with a calculation.

Problem with CALL.
A Job error resulting from a problem with the CALL function (usually because the file does not exist).

Problem with File.
A file input/output error encountered while executing a Job.

Problem with LOOP.
The LOOP statement could not be executed properly in a Job.

Problem with RECALL.
The RECALL statement could not be executed in a Job.

Problem with REPORT.
The REPORT function could not be exercised in a Job.

Problem with RUN.
The specified program could not be RUN from a Job.

Problem with SAVE.
The SAVE function could not be executed in a Job.

Sample Changer Hardware Failure.
The Sample Changer hardware handshake failed in some way; usually the result of too much time before SAMPLE READY is obtained.

Syntax Error.
A syntax error in a Job, meaning that a command could not be interpreted; usually the result of misspelling.

Token Error.
A token error in a Job, meaning that some argument to the command was invalid or out of context.

Unable to COMPARE files of different sizes.
The COMPARE function requires compatible files.

Unable to open file -- STRIP aborted.
The STRIP function is aborted if the file cannot be read.

Unable to open file for COMPARE.
The COMPARE function is aborted if the second spectrum cannot be read.

Unable to strip MCB memory.
The stripping function must be performed in the Buffer.

Warning 128.
Warning 64.
Warning 8.
All three of the above messages are the result of MCB START or STOP warnings and are hardware dependent.

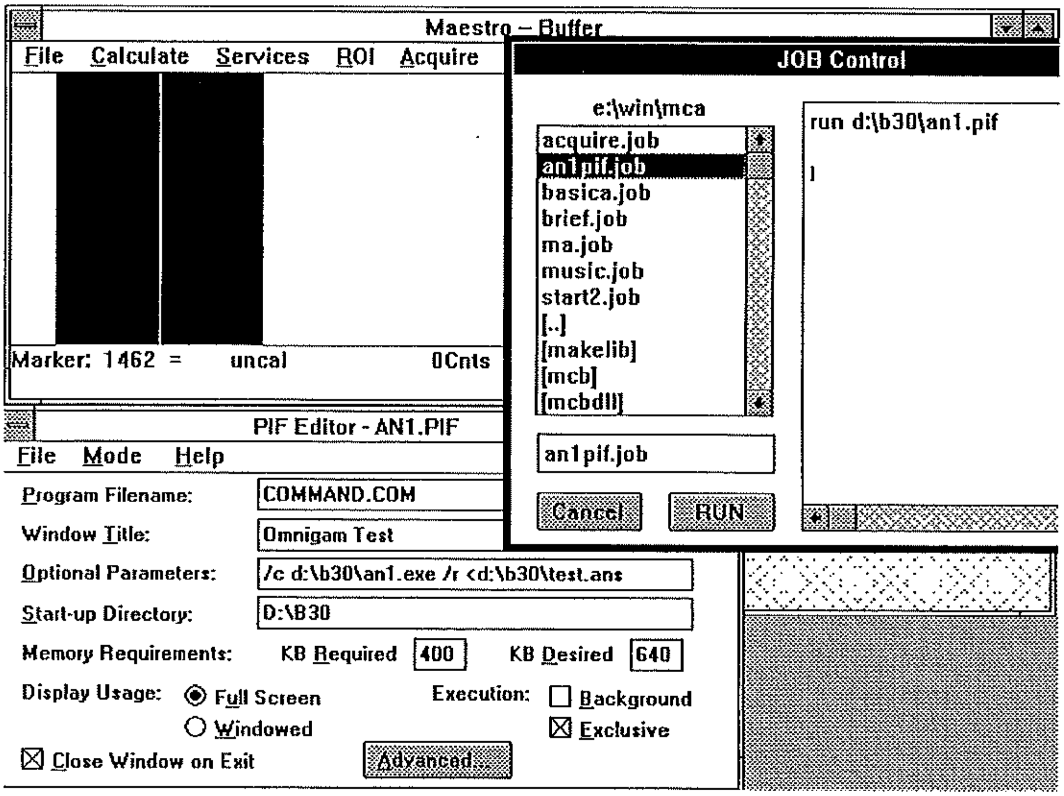
Warning: Buffer was modified.
When the MAESTRO program is being closed, this message will appear if the Buffer spectrum had been modified but not yet saved to disk. Thus the user is prompted for confirmation of possibly saving the Buffer before proceeding to terminate the application.

Appendix C. CREATING AN1.EXE

AN1.EXE can be called directly from a Job file with the "RUN" command, but will not run to completion before returning to MAESTRO, because it is not spawned at the proper priority level. Therefore, a .PIF file is required to establish exclusive full-screen execution.

Furthermore, if an answer file is required, the .PIF file must run COMMAND.COM to launch AN1. This is because Windows does not allow file indirection. The indirection must be performed via COMMAND.COM.

Therefore, the suggested .JOB file command and .PIF file contents to run AN1.EXE synchronously are shown in Fig. 52.



Marker: 1462 = uncal 0Cnts

e:\win\mca

- acquire.job
- an1pif.job
- basica.job
- brief.job
- ma.job
- music.job
- start2.job
- [..]
- [makelib]
- [mcb]
- [mcbdll]

an1pif.job

```
run d:\b30\an1.pif
]
```

Program Filename: COMMAND.COM

Window Title: Omnigam Test

Optional Parameters: /c d:\b30\an1.exe /r <d:\b30\test.ans

Start-up Directory: D:\B30

Memory Requirements: KB Required 400 KB Desired 640

Display Usage: ● Full Screen ○ Windowed

Execution: ☐ Background ☒ Exclusive

☒ Close Window on Exit

Fig. 52. Details required to run OMNIGAM from a WinMca Job.

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